

**UNITED STATES DISTRICT COURT
FOR THE SOUTHERN DISTRICT OF MISSISSIPPI
NORTHERN DIVISION**

LATOYA BROWN; LAWRENCE BLACKMON;
HERBERT ANTHONY GREEN; KHADAFY
MANNING; QUINNETTA MANNING; MARVIN
MCFIELD; NICHOLAS SINGLETON; STEVEN
SMITH; BESSIE THOMAS; and BETTY JEAN
WILLIAMS TUCKER, individually and on behalf of a
class of all others similarly situated,

Plaintiffs,

v.

MADISON COUNTY, MISSISSIPPI; SHERIFF
RANDALL S. TUCKER, in his official capacity; and
MADISON COUNTY SHERIFF'S DEPUTIES JOHN
DOES #1 through #6, in their individual capacities,

Defendants.

Civil Action No.
3:17-cv-00347-WHB-LRA

**ORAL ARGUMENT
REQUESTED**

**REPLY MEMORANDUM OF LAW IN FURTHER SUPPORT
OF PLAINTIFFS' MOTION FOR CLASS CERTIFICATION**

SIMPSON THACHER & BARTLETT LLP
425 Lexington Avenue
New York, NY 10017
(212) 455-2000

AMERICAN CIVIL LIBERTIES UNION OF
MISSISSIPPI FOUNDATION
233 East Capitol Street
Jackson, MS 39201
(601) 354-3408

AMERICAN CIVIL LIBERTIES UNION
FOUNDATION
125 Broad Street
New York, NY 10004
(212) 549-2610

Attorneys for Plaintiffs

TABLE OF CONTENTS

	Page
PRELIMINARY STATEMENT	1
ARGUMENT	3
I. DEFENDANTS’ CHALLENGES TO CLASS DEFINITIONS FAIL	3
II. THE NUMEROSITY REQUIREMENT IS SATISFIED	6
III. THE COMMONALITY REQUIREMENT IS SATISFIED	7
A. Individual Issues Of Causation Do Not Defeat Commonality	7
B. Plaintiffs Have Presented Significant Proof Of The Challenged Policies	9
1. Defendants’ Denial Of The Existence Of The Policies Is Immaterial	9
2. Plaintiffs Have Shown Significant Evidence Of Discriminatory Intent	11
3. Defendants’ Criticisms Of Plaintiffs’ Statistics And Data Lack Merit	13
(a) Criticisms Of Dr. Ricchetti’s Analysis Lack Merit	13
(b) Criticisms Of Dr. Guha’s Data Lack Merit	16
4. Defendants’ Assertions Concerning MCSD Roadblocks Fail	18
5. Defendants’ Contentions Regarding Pedestrian Stops Lack Merit	20
IV. THE TYPICALITY REQUIREMENT IS SATISFIED	20
V. THE ADEQUACY REQUIREMENT IS SATISFIED	22
A. The Absence Of Class Damages Claims Does Not Create a Conflict	22
B. The Mannings’ Individual Damages Claims Do Not Impair Adequacy	24
C. No Other Conflict Exists Within The Class	24
VI. RULE 23(b)(2) IS SATISFIED	26
CONCLUSION	27

TABLE OF AUTHORITIES

Cases

<i>Alston v. Virginia High School League, Inc.</i> , 184 F.R.D. 574 (W.D. Va. 1999)	26
<i>Amgen Inc. v. Conn. Ret. Plans & Trust Funds</i> , 568 U.S. 455 (2013)	9
<i>Bailey v. Ryan Stevedoring Co.</i> , 528 F.2d 551 (5th Cir. 1976)	26
<i>Bogard v. Cook</i> , 586 F.2d 399 (5th Cir. 1978)	23
<i>Borum v. Brentwood Vill., LLC</i> , 324 F.R.D. 1 (D.D.C. 2018)	6
<i>Burns v. Thiokol Chem. Corp.</i> , 483 F.2d 300 (5th Cir. 1973)	14
<i>Butler v. Illinois Bell Tel. Co.</i> , 2008 WL 474367 (N.D. Ill. Feb. 14, 2008)	24
<i>Chavez v. Illinois State Police</i> , 251 F.3d 612 (7th Cir. 2001)	16
<i>Cole v. City of Memphis</i> , 839 F.3d 530 (6th Cir. 2016)	3
<i>Coleman v. Gen. Motors Acceptance Corp.</i> , 220 F.R.D. 64 (M.D. Tenn. 2004)	24
<i>Crowder v. Lash</i> , 687 F.2d 996 (7th Cir. 1982)	23
<i>Daniels v. City of New York</i> , 198 F.R.D. 409 (S.D.N.Y. 2001)	4
<i>Davis v. Weir</i> , 497 F.2d 139 (5th Cir. 1974)	3
<i>DeBremaecker v. Short</i> , 433 F.2d 733 (5th Cir. 1970)	4
<i>Dockery v. Fischer</i> , 253 F. Supp. 3d 832 (S.D. Miss. 2015)	4, 8, 9

<i>Eddleman v. Jefferson Cty.</i> , 96 F.3d 1448, 1996 WL 495013 (6th Cir. 1996)	8
<i>Floyd v. City of New York</i> , 283 F.R.D. 153 (S.D.N.Y. 2012)	5, 8, 10
<i>Floyd v. City of New York</i> , 959 F. Supp. 2d 668 (S.D.N.Y. 2013)	27
<i>Forbush v. J.C. Penney Co., Inc.</i> , 994 F.2d 1101 (5th Cir. 1993)	7
<i>Fortner v. Thomas</i> , 983 F.2d 1024 (11th Cir. 1993)	23
<i>Gutierrez v. City of E. Chicago</i> , 2016 WL 5819818 (N.D. Ind. Sept. 6, 2016)	8
<i>Heck v. Humphrey</i> , 512 U.S. 477 (1994)	5
<i>Hiser v. Franklin</i> , 94 F.3d 1287 (9th Cir. 1996)	23
<i>Horton v. Goose Creek Ind. Sch. Dist.</i> , 690 F.2d 470 (5th Cir. 1982)	26
<i>In re Cincinnati Policing</i> , 209 F.R.D. 395 (S.D. Ohio 2002)	5
<i>In re Monumental Life Ins. Co.</i> , 365 F.3d 408 (5th Cir. 2004)	3, 6
<i>In re Rodriguez</i> , 695 F.3d 360 (5th Cir. 2012)	6
<i>In re TFT-LCD (Flat Panel) Antitrust Litig.</i> , 2012 WL 273883 (N.D. Cal. Jan. 30, 2012)	24
<i>Ingles v. City of New York</i> , 2003 WL 402565 (S.D.N.Y. Feb. 20, 2003)	24
<i>James v. City of Dallas</i> , 254 F.3d 551 (5th Cir. 2001)	22
<i>Johnson v. Am. Credit Co. of Georgia</i> , 581 F.2d 526 (5th Cir. 1978)	24

<i>Johnson v. City of Opelousas</i> , 658 F.2d 1065 (5th Cir. 1981)	5
<i>Johnson v. Gen. Motors Corp.</i> , 598 F.2d 432 (5th Cir. 1979)	23
<i>Jones v. Diamond</i> , 519 F.2d 1090 (5th Cir. 1975)	3
<i>Jones v. Robinson Prop. Grp., L.P.</i> , 427 F.3d 987 (5th Cir. 2005)	13
<i>Jones-Bey v. Caso</i> , 535 F.2d 1360 (2nd Cir. 1976)	23
<i>Kurlander v. Kroenke Arena Co., LLC</i> , 276 F. Supp. 3d 1077 (D. Colo. 2017)	4
<i>Lee v. Verizon Commc'ns, Inc.</i> , 837 F.3d 523 (5th Cir. 2016)	8
<i>M.D. v. Perry</i> , 294 F.R.D. 7 (S.D. Tex. 2013)	7, 8
<i>Maldonado v. Ochsner Clinic Found.</i> , 493 F.3d 521 (5th Cir. 2007)	26
<i>Martin v. F.E. Moran, Inc.</i> , 2018 WL 1565597 (N.D. Ill. Mar. 30, 2018)	11
<i>McClain v. Lufkin Indus., Inc.</i> , 2010 WL 455351 (E.D. Tex. Jan. 15, 2010)	28
<i>McClain v. Lufkin Indus., Inc.</i> , 519 F.3d 264 (5th Cir. 2008)	23
<i>Melendres v. Arpaio</i> , 784 F.3d 1254 (9th Cir. 2015)	27
<i>Mendoza v. Bell Helicopter & Textron, Inc.</i> , 2012 WL 12878157 (N.D. Tex. Oct. 3, 2012).....	11
<i>Milliken v. Bradley</i> , 433 U.S. 267 (1977)	27
<i>Morrow v. Washington</i> , 277 F.R.D. 172 (E.D. Tex. 2011)	passim

<i>Norris v. Slothouber</i> , 718 F.2d 1116 (D.C. Cir. 1983).....	23
<i>ODonnell v. Harris Cty.</i> , 2017 WL 1542457 (S.D. Tex. Apr. 28, 2017).....	4, 6
<i>Ortega-Melendres v. Arpaio</i> , 836 F. Supp. 2d 959 (D. Ariz. 2011)	5, 8, 13, 24
<i>Palmer v. Thompson</i> , 391 F.2d 324 (5th Cir. 1967)	27
<i>Peterson v. City of Ft. Worth</i> , 588 F.3d 838 (5th Cir. 2009)	9
<i>Peterson v. Oklahoma Housing Authority</i> , 545 F.2d 1270 (10th Cir. 1976)	26
<i>Russo v. City of Cincinnati</i> , 953 F.2d 1036 (6th Cir. 1992)	10
<i>Serna v. Transp. Workers Union of Am., AFL-CIO</i> , 2014 WL 7721824 (N.D. Tex. Dec. 3, 2014).....	25
<i>Shelton v. Bledsoe</i> , 775 F.3d 554 (3d Cir. 2015)	3
<i>Shook v. El Paso Cty.</i> , 386 F.3d 963 (10th Cir. 2004)	3
<i>Slade v. Progressive Sec. Ins. Co.</i> , 856 F.3d 408 (5th Cir. 2017)	23
<i>Stockwell v. City & Cty. of San Francisco</i> , 749 F.3d 1107 (9th Cir. 2014)	17
<i>Thelwell v. City of New York</i> , 2015 WL 4545881 (S.D.N.Y. July 28, 2015).....	12
<i>United States ex rel. Vavra v. Kellogg Brown & Root, Inc.</i> , 848 F.3d 366 (5th Cir. 2017)	9
<i>United States v. City of Parma</i> , 661 F.2d 562 (6th Cir. 1981)	27
<i>United States v. Johnson</i> , 122 F. Supp. 3d 272 (M.D.N.C. 2015)	13, 16, 17

<i>Veasey v. Abbott</i> , 830 F.3d 216 (5th Cir. 2016)	10
<i>Verde v. Stoneridge, Inc.</i> , 2016 WL 9022449 (E.D. Tex. Nov. 7, 2016).....	6
<i>Wal-Mart Stores, Inc. v. Dukes</i> , 564 U.S. 338 (2011)	7
<i>Watkins v. Recreation & Park Comm’n</i> , 2013 WL 6834376 (M.D. La. Dec. 26, 2013)	11
<i>Williams v. Bramer</i> , 180 F.3d 699 (5th Cir. 1999)	13
<i>Yaffe v. Powers</i> , 454 F.2d 1362 (1st Cir. 1972).....	3
<i>Zachery v. Texaco Expl. & Prod., Inc.</i> , 185 F.R.D. 230 (W.D. Tex. 1999).....	23
<i>Zeigler v. Town of Kent</i> , 258 F. Supp. 2d 49 (D. Conn. 2003)	9
Statutes, Rules, and Constitutional Provisions	
42 U.S.C. § 1983	1
42 U.S.C. § 2000d	1
Fed. R. Civ. P. 23	3
Fed. R. Civ. P. 23 Adv. Comm. Notes, <i>reprinted in</i> 39 F.R.D. 69 (1966).....	4
Fed. R. Civ. P. 23(b)(2)	passim
Fed. R. Civ. P. 23(b)(3)	3, 4
Fed. R. Evid. 1006	16
U.S. CONST. amend. IV	passim
U.S. CONST. amend. XIV	passim
U.S. CONST. art. III	8

Other Authorities

5 JAMES WM. MOORE ET AL., MOORE’S FEDERAL PRACTICE § 23.21(6) (3d ed.).....	4
5 JAMES WM. MOORE ET AL., MOORE’S FEDERAL PRACTICE § 23.25(2)(b)(ii) (3d ed.)	25
MCLAUGHLIN ON CLASS ACTIONS § 4:5 (11th ed. 2014)	6

Plaintiffs respectfully submit this memorandum of law in further support of their motion for class certification (the “Motion” or “Motion for Class Certification”).¹

PRELIMINARY STATEMENT

Plaintiffs seek to certify one class (the “Targeting Class”) and two subclasses (the “Roadblock Subclass” and the “Pedestrian Stop Subclass”) in this Rule 23(b)(2) civil rights action. The Targeting Class challenges under the Fourteenth Amendment the MCSD’s policy of racially profiling and targeting Black persons (the “Policing Program”).² The two subclasses challenge specific aspects of the Policing Program, each of which violates both the Fourth and Fourteenth Amendments. The Roadblock Subclass challenges the MCSD’s policy of (i) disproportionately targeting Madison County’s Black communities for roadblock enforcement (a Fourteenth Amendment claim), and (ii) conducting such roadblocks for general crime control purposes and without proper procedural safeguards (a Fourth Amendment claim). The Pedestrian Stop Subclass challenges the MCSD’s policy of conducting suspicionless stops of pedestrians (i) on the basis of race (a Fourteenth Amendment claim) and (ii) without reasonable suspicion or probable cause (a Fourth Amendment claim). Membership in the proposed classes include Black persons who presently or in the future reside in or travel through Madison County and thus are or will become subject to the challenged policies.

None of Defendants’ attacks on Plaintiffs’ motion has merit; indeed, most are simply broadsides against Rule 23(b)(2) itself. *First*, Defendants’ challenges to Plaintiffs’ class definitions seek to import ascertainability requirements that apply only to damages classes;

¹ Terms not defined herein are defined in Plaintiffs’ opening brief (“Br. ____”). Exhibits to the Motion are cited as “PX ____”; exhibits to Defendants’ opposition are cited as “DX ____.” Exhibits attached to this brief are cited as “Ex. ____.” Defendants’ opposition brief is cited as “Opp. ____.”

² Because the legal standards for Fourteenth Amendment claims brought under 42 U.S.C. § 1983 and for claims under Title VI of the Civil Rights Act, 42 U.S.C. § 2000d, are identical, references to one claim in this memorandum should be understood to include the other.

courts, however, consistently certify Rule 23(b)(2) classes that are defined in terms substantially similar to those proposed here. *Second*, Defendants' cursory challenge to numerosity proceeds from the premise that to find numerosity in a Rule 23(b)(2) class, a court must individually analyze the merits of unnamed class members' claims. No law supports this conceptually flawed and wholly impractical proposition. *Third*, Defendants' legal challenge to commonality seeks, again, to require individual analyses of unnamed class members' claims at class certification, and otherwise conflates class certification with the merits. Defendants' factual challenges to commonality fail as well. Plaintiffs have presented significant proof of the policies underlying the class claims, as is further demonstrated herein and in the rebuttal expert reports submitted herewith by Plaintiffs.³ *Fourth*, Defendants' argument against typicality merely restates their meritless arguments for summary judgment, already addressed by Plaintiffs; Defendants do not otherwise seriously contend that the claims asserted are not typical of the class and subclasses. *Fifth*, Defendants' attempts to hypothesize nonexistent conflicts within the class fail to defeat Plaintiffs' showing of adequacy. Defendants do not demonstrate any conflicts arising from Plaintiffs' non-assertion of class damages claims, and provide no evidence of community support for the challenged policies. *Finally*, Defendants' complaint that no workable injunction could be fashioned is misguided, as courts regularly grant injunctive relief in Rule 23(b)(2) civil rights actions such as that proposed by Plaintiffs here. Defendants' objections should be rejected and the class and subclasses proposed by Plaintiffs should be certified.

³ Along with a rebuttal report submitted by Dr. Bryan Ricchetti (Ex. 1, "Ricchetti Rebuttal" or "Ricchetti R.R."), Plaintiffs are submitting rebuttal reports by (1) Dr. Justin McCrary, rebutting Dr. Steward's assertions concerning the methodology employed by Dr. Ricchetti (Ex. 2, "McCrary Rebuttal" or "McCrary R.R."); (2) Dr. Patricia Frontiera, rebutting Mr. Funderburk's claims concerning geocoding issues related to Dr. Ricchetti's analysis (Ex. 3, "Frontiera Rebuttal" or "Frontiera R.R."); and (3) Mr. Robert McNeilly, a law enforcement expert and former Chief of the Pittsburgh police department, in rebuttal of Mr. Dunston's contentions regarding the sufficiency of the MCSO's policies and procedures (Ex. 4, "McNeilly Rebuttal" or "McNeilly R.R."). These rebuttal reports are attached as exhibits to this memorandum.

ARGUMENT

I. DEFENDANTS’ CHALLENGES TO CLASS DEFINITIONS FAIL

Defendants first argue that Plaintiffs’ proposed class and subclasses fail for lack of ascertainability because membership is not restricted to specific identifiable persons with enforceable claims not subject to potential defenses. Defendants’ arguments improperly seek to impose the strict ascertainability requirements applicable to Rule 23(b)(3) damages classes onto this Rule 23(b)(2) case, and otherwise misconstrue the precedents on which Defendants rely.⁴

At least four of the Courts of Appeals have expressly held that the ascertainability requirements applicable to Rule 23(b)(3) classes do not apply to Rule 23(b)(2); none has reached a contrary conclusion. *See Cole v. City of Memphis*, 839 F.3d 530 (6th Cir. 2016); *Shelton v. Bledsoe*, 775 F.3d 554 (3d Cir. 2015); *Shook v. El Paso Cty.*, 386 F.3d 963 (10th Cir. 2004); *Yaffe v. Powers*, 454 F.2d 1362 (1st Cir. 1972). These courts recognize that “ascertainability is a requirement tied almost exclusively to the practical need to notify absent class members and to allow those members a chance to opt-out and avoid the potential collateral estoppel effects of a final judgment,” considerations specific to the Rule 23(b)(3) context. *Cole*, 839 F.3d at 541. Fifth Circuit law is in accord. Rule 23 “does not mandate that all members of the (b)(2) class be aggrieved by or desire to challenge the defendant’s conduct,” *Davis v. Weir*, 497 F.2d 139, 146 (5th Cir. 1974), and therefore “it is not necessary that the members of the class be so clearly identified that any member can be presently ascertained.” *Jones v. Diamond*, 519 F.2d 1090,

⁴ Defendants complain that the class and subclass definitions proposed in Plaintiffs’ motion for class certification do not precisely track, and are narrower than, the class definition set forth in Plaintiffs’ Complaint. *See* Opp. 4-6. Defendants do not, however, actually argue that this is grounds for denying class certification, and any such argument would be contrary to Fifth Circuit law. *See In re Monumental Life Ins. Co.*, 365 F.3d 408, 414 (5th Cir. 2004) (“Holding plaintiffs to the plain language of the class definition would be overly formalistic” and “would ignore the ongoing refinement and give-and-take inherent in class action litigation, particularly in the formation of a workable class definition. District courts are permitted to limit or modify class definitions to provide the necessary precision.”).

1100 (5th Cir. 1975); *see also ODonnell v. Harris Cty.*, 2017 WL 1542457, at *3 (S.D. Tex. Apr. 28, 2017) (“[S]trict ascertainability requirements ... do not apply to a Rule 23(b)(2) class seeking prospective relief under the Fifth Circuit’s standard for civil rights litigation.”); *Dockery v. Fischer*, 253 F. Supp. 3d 832, 848 (S.D. Miss. 2015) (“The common practice or policy does not have to injure every class member or injure them in exactly the same manner.”).⁵

As support for their position, Defendants cite *DeBremaecker v. Short*, 433 F.2d 733 (5th Cir. 1970) (*see* Opp. 34), an early case in which a proposed class composed of “residents of this State active in the ‘peace movement’” was held to be not “adequately defined or clearly ascertainable” due to (i) “the patent uncertainty of the meaning of ‘peace movement’” and (ii) the overbreadth of a class of all Texas residents where the complaint only challenged a Houston city ordinance. *DeBremaecker*, 433 F.2d at 734. Defendants, however, cite no authority suggesting that *DeBremaecker*’s rejection of this particular class definition imposes Rule 23(b)(3) ascertainability standards on Rule 23(b)(2) classes. *See ODonnell*, 2017 WL 1542457, at *3 (rejecting this argument and distinguishing *DeBremaecker*).

Apart from *DeBremaecker*, Defendants rely primarily on selective quotation of the legal standards articulated in *Morrow v. Washington*, 277 F.R.D. 172 (E.D. Tex. 2011), a ruling that *granted* certification of a Rule 23(b)(2) policing class. *See* Opp. 33-37. That class was defined as members of “racial or ethnic minority groups” who were or will be “subject to being stopped by one or more Defendant for an alleged traffic violation.” 277 F.R.D. at 189. The court found that

⁵ *Accord Kurlander v. Kroenke Arena Co., LLC*, 276 F. Supp. 3d 1077, 1084 (D. Colo. 2017) (“[T]he question of administrative feasibility is not pertinent to a class certified pursuant to Rule 23(b)(2).”); *Daniels v. City of New York*, 198 F.R.D. 409, 415 (S.D.N.Y. 2001) (“The absence of a claim for money damages eliminates the need for individualized assessments of liability and harm.”) (citing *Forbush v. J.C. Penney Co.*, 994 F.2d 1101 (5th Cir. 1993)); 5 JAMES WM. MOORE ET AL., MOORE’S FEDERAL PRACTICE § 23.21(6) (3d ed.) (“precise class definition is less critical” in (b)(2) cases); Fed. R. Civ. P. 23 Adv. Comm. Notes, 39 F.R.D. 69, 102 ((b)(2) class proper even if the challenged conduct “has taken effect or is threatened only as to one or a few members of the class, provided it is based on grounds which have general application to the class”).

“the inclusion ... of those who may in the future be subject to the interdiction program” was “not a bar to certification” even though such persons could not be “specifically identified.” *Id.*⁶

Tellingly, Defendants’ ascertainability standards would also have defeated certification in *Morrow*. First, while Defendants contend that identification of each class member is required (Opp. 34), *Morrow* explained that inclusion of unknown class members is unproblematic, as a Rule 23(b)(2) class is “usually one whose members are incapable of specific enumeration.” 277 F.R.D. at 189. Second, Defendants’ complaint that the proposed class includes persons “who have no putative claim” (Opp. 35) also applies to *Morrow*, which defined membership, without limitation, in terms of being “subject to being stopped ... for an alleged traffic violation.” 277 F.R.D. at 189. Third, *Morrow* did not attempt to exclude persons whose claims might be subject to defenses such as the bar of *Heck v. Humphrey*, 512 U.S. 477 (1994). Opp. 37.⁷ Defendants’ interpretation of the law applied in *Morrow* is thus incompatible with the result in that case.

Indeed, Rule 23(b)(2) civil rights classes are routinely defined in ways that contradict Defendants’ purported ascertainability requirements.⁸ Defendants cite no precedent in which a

⁶ Courts routinely certify Rule 23(b)(2) classes including persons at risk of future harm. *See, e.g., Johnson v. City of Opelousas*, 658 F.2d 1065, 1070 (5th Cir. 1981) (certifying class of “all persons who have been or in the future will be arrested or detained ...”); *Ortega-Melendres v. Arpaio*, 836 F. Supp. 2d 959, 991 (D. Ariz. 2011) (“[T]he fact that the class includes future members does not ... preclude certification.”).

⁷ Defendants cite no authority, and Plaintiffs have found none, denying certification of a Rule 23(b)(2) class based on the potential presence of defenses to hypothetical claims of individual class members, such as the *Heck* claim bar. This makes sense because Rule 23(b)(2) classes seek only prospective non-monetary relief and do not adjudicate unnamed class members’ specific claims for alleged past harms.

⁸ *See, e.g., Floyd v. City of New York*, 283 F.R.D. 153, 160 (S.D.N.Y. 2012) (“All persons who since January 31, 2005 have been, or in the future will be, subjected to the New York Police Department’s policies and/or widespread customs or practices of stopping, or stopping and frisking, persons ... in violation of the Fourth Amendment, including persons stopped or stopped and frisked on the basis of being Black or Latino in violation of the Equal Protection Clause of the Fourteenth Amendment.”); *Ortega-Melendres v. Arpaio*, 836 F. Supp. 2d 959, 992 (D. Ariz. 2011) (“All Latino persons who, since January 2007, have been or will be in the future, stopped, detained, questioned or searched by MCSO agents while driving or sitting in a vehicle on a public roadway or parking area in Maricopa County, Arizona.”); *In re Cincinnati Policing*, 209 F.R.D. 395, 397 (S.D. Ohio 2002) (all Black persons who are or will be “stopped, detained or arrested” by defendants).

court applied remotely similar standards,⁹ and adoption of such standards would effectively foreclose civil rights class litigation. They should be rejected.¹⁰

II. THE NUMEROSITY REQUIREMENT IS SATISFIED

Defendants' cursory challenge to numerosity (Opp. 38-39) is predicated on the erroneous assertion, discussed above, that the Court must somehow adjudicate the viability of each individual unnamed class member's claims before certifying a Rule 23(b)(2) class. Defendants concede that if this argument fails, numerosity is established. *Id.* 38.

Defendants cite no case law whatsoever, much less any case law in the Rule 23(b)(2) context, suggesting that individualized assessment of potential defenses to specific claims has any part in the numerosity analysis. To the contrary, it is black letter law that numerosity "does not entail an assessment of how many putative class members ultimately will have meritorious claims." MCLAUGHLIN ON CLASS ACTIONS § 4:5 (11th ed. 2014); *accord Morrow*, 277 F.R.D. at 191 (finding numerosity satisfied based on data regarding total number of stops of proposed class members).¹¹

⁹ Defendants rely on *In re Monumental Life Ins. Co.* (Opp. 35-36), but that case involved damages claims and, therefore, notice and opt-out rights. 365 F.3d 408, 413 (5th Cir. 2004). In explaining why a "precise class definition" was necessary, the court specifically distinguished classes involving only, as here, class claims for declaratory and injunctive relief. *Id.*

¹⁰ Defendants also contend that because the proposed class and subclasses are defined in terms of persons subject to the policing policies Plaintiffs challenge, they "fail[] because this Court must make a determination of the merits of the individual claims to determine whether a particular person is a member of the class." Opp. 35. Even assuming this is correct, Fifth Circuit law authorizes certification of "a class whose membership can only be ascertained by a determination on the merits of the case because the class is defined in terms of the ultimate question of liability." *In re Rodriguez*, 695 F.3d 360, 369-70 (5th Cir. 2012). All that is required is that the class members be "similarly linked by a common complaint." *Id.* at 370; *see also ODonnell*, 2017 WL 1542457, at *3 (same). The proposed class plainly meets this criterion.

¹¹ *See also Verde v. Stoneridge, Inc.*, 2016 WL 9022449, at *4 (E.D. Tex. Nov. 7, 2016) ("A plaintiff is only required to bring forth evidence relevant to numerosity of the 'purported class,' not the number of class members who may prevail on the merits.") (quoting *Zeidman v. J. Ray McDermott & Co.*, 651 F.2d 1030, 1038 (5th Cir. 1981)); *Borum v. Brentwood Vill., LLC*, 324 F.R.D. 1, 11 (D.D.C. 2018) ("[D]etermining that numerosity cannot be established because only a handful of class members will eventually prevail on the merits of their claim puts the cart before the horse.") (quotation omitted).

III. THE COMMONALITY REQUIREMENT IS SATISFIED

Plaintiffs have provided significant proof of the MCSD's Policing Program, a longstanding policy of racial profiling and of disproportionately targeting Black persons for stops, searches, and seizures. This policy, which violates the Fourteenth Amendment, is implemented in part through two practices that violate the Fourth Amendment: (i) the MCSD's policy of disproportionately conducting roadblocks in Black neighborhoods for purposes of crime control and without proper procedural safeguards; and (ii) the MCSD's policy of conducting suspicionless stops of pedestrians in Black neighborhoods. Contrary to Defendants' contentions, these policies present common questions, the answers to which will "drive the resolution of this litigation." *Wal-Mart Stores, Inc. v. Dukes*, 564 U.S. 338, 350 (2011).

A. Individual Issues Of Causation Do Not Defeat Commonality

Defendants' primary legal challenge to commonality is that the policies challenged by Plaintiffs do not themselves "establish causation and constitutional injury," and that "[a]bsent proof of concrete injury, no relief, and certainly no classwide injunctive relief, can be authorized." Opp. 46-47; *see also id.* 50 ("[P]roof of the supposed illegal policies will not establish defendants' liability to anyone [C]lass members would have to prove an injury and its causation by the policy ..."). As with their ascertainability argument, Defendants quixotically attempt to defend their untenable position by citing cases in which class certification was *granted* (this Court's decision in *Dockery*, and the district court ruling in *M.D. v. Perry*, 294 F.R.D. 7 (S.D. Tex. 2013)). Defendants, again, cite no cases in which a court actually denied Rule 23(b)(2) certification on this basis, and the Fifth Circuit has cautioned that courts should not credit arguments that "if accepted, would preclude certification of just about any class of persons." *Forbush v. J.C. Penney Co., Inc.*, 994 F.2d 1101, 1105 (5th Cir. 1993). That principle applies with full force here, and compels rejection of Defendants' causation arguments.

“In a civil rights suit, commonality is satisfied where the lawsuit challenges a system-wide practice or policy that affects all of the putative class members.” *Ortega-Melendres*, 836 F. Supp. 2d at 989; *see also Gutierrez v. City of E. Chicago*, 2016 WL 5819818, at *14 (N.D. Ind. Sept. 6, 2016) (“The common question is not whether each individual class member experienced an unconstitutional search but rather whether Defendants maintain a policy and practice ...”). The claim that Plaintiffs must establish causation before certification conflates class certification with the merits phase: while “Plaintiffs will have to prove a causal connection” in order to “prevail on the merits, ... [a]t class certification ... they do not need to prove that they are entitled to relief.” *Perry*, 294 F.R.D. at 44. In other words, “class certification does not require the plaintiffs to establish that the harm actually occurred, i.e., they do not need to prove that the policies they identified did, in fact, cause the harm they are alleging.” *Dockery*, 253 F. Supp. 3d at 848.¹²

Courts, therefore, consistently reject arguments that individual facts applicable to specific class members defeat commonality despite the existence of a policy underlying the class’s common claim. This is true for Fourteenth Amendment claims, *see Perry*, 294 F.R.D. at 44 (contention “that Plaintiffs’ Fourteenth Amendment claim necessitates an individualized inquiry into the circumstances of each class member, defeating commonality ... is not persuasive”), and for Fourth Amendment claims. *See Floyd*, 283 F.R.D. at 170 (theory that Fourth Amendment classes cannot be certified because the “analysis is highly specific and unique in every case” is commonly raised “despite its unsurprising lack of success for over three decades”); *Eddleman v. Jefferson Cty.*, 96 F.3d 1448, 1996 WL 495013, at *3-4 (6th Cir. 1996) (commonality satisfied even though “some individuals may fail to meet the qualifications for the class because it can be

¹² *Lee v. Verizon Commc’ns, Inc.*, 837 F.3d 523 (5th Cir. 2016) (Opp. 47), says nothing about either commonality or causation, and is of minimal relevance here. *Lee* instead found that a class representative lacked Article III standing where he did not allege that any concrete interest of his was put at risk by the alleged violation of the procedural right that formed the basis of his claim. *See* 837 F.3d at 530.

shown that there was reasonable suspicion to search them”). Plaintiffs’ common questions of law and fact thus more than suffice to satisfy commonality.

B. Plaintiffs Have Presented Significant Proof Of The Challenged Policies

Defendants also raise factual challenges to commonality. Defendants deny the existence of the Policing Program; attempt to explain away Plaintiffs’ evidence of discrimination; challenge Plaintiffs’ statistics and data; and attempt to salvage the constitutionality of their Roadblock and Pedestrian Stop Programs. Much of this is premature, as “Rule 23 grants courts no license to engage in free-ranging merits inquiries at the certification stage.” *Amgen Inc. v. Conn. Ret. Plans & Trust Funds*, 568 U.S. 455, 466 (2013). Defendants’ attempt to offer alternative explanations for the policing programs at issue thus misses the mark at the class certification stage. In any event, Defendants’ arguments do not and cannot defeat commonality.

1. Defendants’ Denial Of The Existence Of The Policies Is Immaterial

Defendants first assert that no policies sanctioning discrimination exist because “[Sheriff Tucker] denies it, and no member of his staff claims to follow such a policy.” Opp. 41. Such self-serving denials have little probative force.¹³ The MCSD’s two-sentence non-discrimination policy (Opp. 8) is also non-probative. Courts recognize that “a policy or practice for the purposes of establishing commonality need not be officially adopted,” *Dockery*, 253 F. Supp. 3d at 853,¹⁴

¹³ See *United States ex rel. Vavra v. Kellogg Brown & Root, Inc.*, 848 F.3d 366, 380 n.5 (5th Cir. 2017) (“[S]elf-serving denials do not prevent contrary findings to be made based on the overall record.”); *Zeigler v. Town of Kent*, 258 F. Supp. 2d 49, 56 (D. Conn. 2003) (“It is the rare case, indeed, where a defendant would admit to having acted with racial animus.”).

¹⁴ Defendants argue that “[t]o the extent that plaintiffs allege a ‘widespread-practice’ of committing unconstitutional violations, the Fifth Circuit has rejected such claims ‘for failure to demonstrate a pattern of similar incidents.’” Opp. 43 (quoting *Peña v. City of Rio Grande City*, 879 F.3d 613, 622 n.14 (5th Cir. 2018)). If Defendants contend that “widespread practice” claims necessarily fail in the Fifth Circuit, they are wrong. Fifth Circuit law is clear that *Monell* liability readily attaches to a widespread pattern or practice “so common and well-settled as to constitute a custom that fairly represents municipal policy.” *Peterson v. City of Ft. Worth*, 588 F.3d 838, 850 (5th Cir. 2009). Defendants’ cases merely hold that a pattern “requires sufficiently numerous prior incidents, as opposed to isolated instances.” *Id.* at 851.

and that “[t]o require direct evidence of intent ... would ignore the reality that neutral reasons can and do mask racial intent.” *Veasey v. Abbott*, 830 F.3d 216, 235-36 (5th Cir. 2016).

In any event, while Defendants assert that Sheriff Tucker “requires his officers” to “abide by” the non-discrimination policy (Opp. 9), there is little evidence of any efforts to ensure compliance or prevent discrimination. Sheriff Tucker and Chief Williams testified that they do nothing to ensure that MCSD deputies are not racially profiling or targeting Madison County’s Black population.¹⁵ The MCSD’s training officer, Lt. Waldrop, does not provide deputies with any training on any policies regarding racial discrimination (PX 25, Waldrop Tr. 30:23-25, 31:8-9), and MCSD personnel generally demonstrated little awareness of such policies.¹⁶

Contrary to Defendants’ contentions (Opp. 8-9), the MCSD’s minimalist approach to training and supervision is neither designed to, nor effective at preventing civil rights violations. Ex. 4, McNeilly R.R. ¶¶ 20; *see also id.* ¶ 40 (“[T]he practices in the department under Sheriff Tucker exhibit (i) limited supervision, (ii) little effort to monitor traffic stops, (iii) an insufficient disciplinary system, and (iv) insufficient systems to capture and review use of force data.”). Indeed, Sheriff Tucker’s lack of interest in whether MCSD personnel engage in racial profiling or other forms of discrimination is conducive to a culture of discriminatory policing, because it “indicates [to officers] the department doesn’t consider [the issue] important.” *Id.* ¶ 61.¹⁷

¹⁵ PX 24, R. Tucker. Tr. 218:14-19 (“I don’t monitor anybody to see if they’re performing in a racially discriminatory manner.”), 128:8-16, 135:12-21, 217:19-218:2; PX 27, Williams Tr. 76:3-8, 151:16-24.

¹⁶ For example, Deputy Barry Chandler—one of the few deputies to give testimony on the MCSD’s nondiscrimination policy—testified that while he knows the MCSD has a policy against racial profiling, he is unaware of what it is. Ex. 5, Chandler Tr. 47:22-48:4.

¹⁷ *See, e.g., Russo v. City of Cincinnati*, 953 F.2d 1036, 1047 (6th Cir. 1992) (rejecting argument “that a municipality may shield itself from liability ... by offering a course nominally covering the subject, regardless of how substandard the content and quality of that training is”); *Floyd*, 959 F. Supp. 2d at 665-66 (finding that the “NYPD has long shown its lack of concern for racial profiling through the failure of NYPD officials and managers to discuss racial profiling among themselves or at [department] meetings” weighs in favor of municipal liability).

2. Plaintiffs Have Shown Significant Evidence Of Discriminatory Intent

Defendants incorrectly contend that Plaintiffs’ evidence of discrimination consists only of “two emails ... and one comment Sheriff Tucker made.” Opp. 9, 42-43. Defendants first address an email titled “White Pride,” cited by Plaintiffs, that was circulated widely in 2009 to white MCSD personnel and then forwarded to others by Sheriff Tucker. Defendants assert that this email merely “complains of the application of a double standard ... and does not advocate racial discrimination.” Opp. 9. Sheriff Tucker, however, himself acknowledged that the email—which is rife with racial slurs and is framed as a “defense” of a public rant in which an actor screamed “nigger” at Black audience members—reflects a “racist opinion.” PX 24, R. Tucker Tr. 63:20-21. Indeed, *Martin v. F.E. Moran, Inc.*, cited by Defendants (Opp. 42), found that this email (and others like it) demonstrated that “certain high-level executives ... held disturbingly racist views and were comfortable expressing these views amongst each other”; and was “indicative of a broad culture of bias.” 2018 WL 1565597, at *27-28 (N.D. Ill. Mar. 30, 2018).¹⁸ Despite conceding the “racist opinion” set forth in the email, Sheriff Tucker testified that he “[did not] know that” circulating the email “violated the ethics policy.” PX 24, R. Tucker Tr. 40:21-41:15.

Sheriff Tucker also “wholeheartedly agree[d]” with a racially charged email sent in 2016 about Paul Griffin, the sole Black member of the Madison County Board of Supervisors. PX 81. Defendants contend that “[t]he email did not offend Mr. Griffin ... and [he] dismissed Sheriff Tucker’s response.” Opp. 10. To the contrary, Mr. Griffin specifically agreed the email

¹⁸ Defendants cite *F.E. Moran* and two other employment discrimination cases, apparently in an attempt to demonstrate that the email is not persuasive evidence of racial bias. *See* Opp. 42. These cases stand for no such proposition. *F.E. Moran* found for the defendants because the parties among whom the emails circulated were not involved in the employment decisions at issue. 2018 WL 1565597, at *29. Similarly, in *Watkins v. Recreation & Park Comm’n*, rather than holding the email did not indicate racial animus, the court found for the defendant because the racial harassment at issue was committed by persons who “did not have authority to take tangible employment actions.” 2013 WL 6834376, at *15 (M.D. La. Dec. 26, 2013). And, in *Mendoza v. Bell Helicopter & Textron, Inc.*, the email “was not forwarded to [the plaintiff] by a supervisor.” 2012 WL 12878157, at *2 (N.D. Tex. Oct. 3, 2012).

expressed racial animus. DX 9, Griffin Tr. 76:9 (“I think he [is] racist or ignorant.”), 82:22-24 (the email expresses “racist sentiments”). That Mr. Griffin could not “say what Sheriff Tucker was thinking” in endorsing the email (*id.* 83:12-13) does not exculpate Defendants.

Defendants provide no non-discriminatory explanation of Sheriff Tucker’s recent comments that Kenneth Stokes, a Black member of the Jackson City Council, was “setting back his race,” and his description of “residents in [Mr. Stokes’] ward, which is predominantly Black” (Opp. 10) as “thug constituents.” *Cf. Thelwell v. City of New York*, 2015 WL 4545881, at *11 (S.D.N.Y. July 28, 2015) (“thug” is a “racial code word[]”). Instead, Defendants appear to excuse the comments by arguing that Sheriff Tucker had been provoked by Mr. Stokes. Opp. 10. Sheriff Tucker testified that he stands by these statements. DX 5, R. Tucker Tr. 287:21-25.¹⁹

Defendants largely ignore Plaintiffs’ other evidence of discriminatory intent, including evidence that current and former MCSD personnel used the racial slur “nigger” while on duty. Former Sheriff Trowbridge testified that MCSD personnel used racial slurs “in passing, maybe in conversation or walking down the hall or walking across a parking lot or whatever.” PX 23, Trowbridge Tr. 96:24-97:2. While Sheriff Tucker denies ever hearing or using racial slurs, Sheriff Trowbridge testified that Sheriff Tucker, other deputies, and Sheriff Trowbridge himself used the term “nigger.” *Id.* 78:6-13, 90:15-91:4, 92:4-7.²⁰ And, as discussed in greater detail in

¹⁹ Defendants assert that “[a]lthough defendants produced thousands of emails, plaintiffs find no other evidence of racism in any of them.” Opp. 42-43. This claim is false. Defendants email production contained about 500 emails, nearly all of which were nonsubstantive. The emails cited by Plaintiffs are among the only approximately 25 emails from that production that contained *any* correspondence from Sheriff Tucker. Defendants also argue, based on information not provided in discovery, that the fact that MCSD case file cover sheets default to “Black,” “Male,” and “Arrested” is irrelevant because these are the first terms in drop-down menus. Opp. 11 n.8. As their own exhibits show, however, the menus are not alphabetical, and the implication of the MCSD’s choice of these as defaults remains the same. *See* ECF 267-12 at 8-9. In any event, more discovery is necessary to ascertain the significance of this issue.

²⁰ The late Terry Barfield, who served as Captain until his death in 2017, also used the term “nigger” while on duty. PX 23, Trowbridge Tr. 90:16-18, 92:4-7. Sgt. Will Weisenberger, a Patrol supervisor, also testified that he has used the term “nigger” in the course of his official duties and that other MCSD

Plaintiffs' opening brief and Plaintiffs' opposition to summary judgment, Plaintiffs and class members have also testified to the MCSD's use of racial slurs and racially charged language.²¹

Defendants instead attempt to downplay this evidence by citing *Williams v. Bramer*, 180 F.3d 699, 706 (5th Cir. 1999) and claiming that the use of racial epithets "without harassment or some other conduct that deprives the victim of established rights, does not amount to an equal protection violation." Opp. 42 & n.35. *Bramer*, however, dealt with a claim arising from a single incident in which the plaintiff's substantive rights were not violated. 180 F.3d at 706. It did not hold that racially derogatory language was irrelevant. To the contrary, *Bramer* confirmed that "[t]he use of an epithet is ... strong evidence" of "racial[] motivat[ion]." *Id.*; accord *Jones v. Robinson Prop. Grp., L.P.*, 427 F.3d 987, 993 (5th Cir. 2005) ("[R]acial epithets undoubtably demonstrate racial animus.").²² Courts have relied on such evidence in similar cases. *See, e.g., Ortega-Melendres*, 836 F. Supp. 2d at 986 (sheriff's forwarding and endorsement of discriminatory emails, including emails from constituents, demonstrated discriminatory intent).

3. Defendants' Criticisms Of Plaintiffs' Statistics And Data Lack Merit

(a) Criticisms Of Dr. Ricchetti's Analysis Lack Merit

The expert report of Dr. Bryan Ricchetti demonstrates a statistically significant relationship between the racial composition of Madison County census tracts and the number and

personnel also use the term while on duty. PX 26, Weisenberger Tr. 132:2-133:11. His testimony was not temporally limited to Trowbridge's administration. *See id.*

²¹ *See, e.g.*, PX 9, Thomas Tr. 77:3-22 (reporting deputy's statement that "I've got all these niggers off the side of this road"); PX 56, Q. Smith Decl. ¶ 14 (reporting deputy's statement that he wasn't "going to help a nigger out" during a traffic stop); PX 59, Tillman Decl. ¶ 23 (reporting deputy's statement that if he had "not taken anger management classes, [he] would drag [Tillman's] black ass up and down the street."); PX 58, T. Thompson Decl. ¶¶ 12-15 (deputy referred to him as a "Black dope boy").

²² Defendants argue (Opp. at 53 & n.36) that "uses of racial epithets" were "insufficient to establish intentional racial discrimination" in *United States v. Johnson*, 122 F. Supp. 3d 272, 371 (M.D.N.C. 2015). Defendants misread *Johnson*, which found that the language at issue was "abhorrent" and "inexcusable," but that the plaintiff, as in *Bramer*, had failed to present evidence of violations of substantive rights. *Id.*

frequency of MCSD roadblocks. While Defendants and their experts raise various objections, they fail to offer any affirmative analyses that would support contrary conclusions. As discussed below and in opposition to Defendants' *Daubert* motion, Defendants' position lacks merit.²³

First, Defendants argue that Dr. Ricchetti's analysis demonstrates that "race-neutral DUI enforcement" is the "predominant factor" in determining roadblock placement, while at the same time somehow faulting Dr. Ricchetti for ignoring this factor. Opp. 16. It is unsurprising that DUI enforcement is relevant to the MCSD's placement of roadblocks. The fact that the MCSD disproportionately targets Madison County's Black communities does not mean that *every* roadblock established by the MCSD targets the Black community, just as the existence of a pattern of racial discrimination in traffic stops would not demonstrate that every individual traffic stop was racially motivated. Dr. Ricchetti's statistical analysis has analytical value precisely because it shows that race has statistically significant explanatory power even when controlling for other relevant factors such as DUI frequency.²⁴

Second, Defendants argue that Dr. Ricchetti "conveniently defines 'High Black Population Percentage'" census tracts to include three tracts whose populations are approximately 46% Black. Opp. 17. This misses the mark. The division of census tracts into high

²³ Defendants incorrectly claim that Dr. Ricchetti "freely admits that he cannot say his data show that Sheriff Tucker maintains a policy of intentionally discriminating against Blacks." Opp. 16. The cited testimony merely makes the obvious point that statistical analysis of law enforcement records does not directly measure Defendants' subjective intentions. *See* Ex. 6, Ricchetti Tr. 216:15-217:14, 226:13-22. This simply means that statistical evidence, like much evidence of discriminatory intent, is indirect: it provides evidence of discriminatory intent by eliminating, through use of controls and regression analyses, potential non-discriminatory reasons for apparent racial disparities. It does not diminish the value of such evidence; to the contrary, "[i]n the problem of racial discrimination, statistics often tell much, and Courts listen." *Burns v. Thiokol Chem. Corp.*, 483 F.2d 300, 305 (5th Cir. 1973).

²⁴ Defendants' complaint that Dr. Ricchetti "ignor[ed]" DUIs because he did not "consider which tracts contain bars and nightclubs" (Opp. 16-17) is baseless. Dr. Ricchetti's analysis directly controls for the frequency of DUIs and traffic offenses, and Defendants provide no basis to believe that their proposed indirect control for DUIs (the number of bars in a census tract) is superior to Dr. Ricchetti's direct control for DUIs (the number of non-roadblock DUI arrests in a census tract). PX 1 ¶¶ 20, 34, & 45-46.

and low Black population percentages is associated solely with Dr. Ricchetti's descriptive analysis of patterns in roadblock locations. Dr. Ricchetti's regression model, *i.e.*, his formal statistical analysis, does not rely on any such groupings. PX 1 ¶¶ 44-48. Thus, Dr. Ricchetti's conclusion that race has statistically significant explanatory power is in no way dependent on these groupings. *See* Ex. 1, Ricchetti R.R. ¶ 46. In any event, Dr. Ricchetti's division of census tracts for purposes of his descriptive analysis is consistent with accepted research methodologies, *see, e.g.*, PX 1 ¶¶ 15-20, and Defendants offer no basis for their claim that patterns in the data must be analyzed in terms of absolute majorities, not variations in population composition.

Third, Defendants argue that Dr. Ricchetti's analysis is flawed because the race of motorists stopped at roadblocks in a particular location might differ from the race of the residents of that same area. Opp. 18.²⁵ Plaintiffs' contention, however, is that Defendants use race-based criteria in determining where to establish roadblocks, and as a result disproportionately establish roadblocks in predominantly-Black areas. Statistical analysis of this contention does not require an assessment of the race of particular motorists; the analysis concerns selection of the roadblock location, not selection of particular motorists for detention or interdiction. *See* Ex. 1, Ricchetti R.R. ¶¶ 16-19; Ex. 2, McCrary R.R. ¶¶ 20-25. And, to the extent that driving behaviors fluctuate across different census tracts that are similarly situated in terms of race, Dr. Ricchetti's analysis

²⁵ Defendants also argue that census tract data is "unreliable for identifying residents at any particular location." Opp. 18-19. However, census tract data (as well as city and county-level data) is routinely used in academic statistical analysis and "is in no way invalidated because the values of variables vary within a census tract (or county or city or state)." Ex. 2, McCrary R.R. ¶ 31. Demographic differences within census tracts are a "type of measurement error that does not create bias" in favor of any particular finding. *Id.* ¶ 32. This is because measurement error tends to be random. For example, Defendants conjecture (without citing any analysis) that many checkpoints are located in the portion of census tract 309 with a relatively higher white population. However, it is equally plausible that some checkpoints are located in the portions of predominantly white census tracts with relatively higher Black populations. Accordingly, demographic differences within census tracts are simply statistical "white noise" that do not bias Dr. Ricchetti's conclusions. Ex. 1, Ricchetti R.R. ¶ 37. If anything, "measurement error will understate the relationship between policing and crime." Ex. 2, McCrary R.R. ¶ 41.

accounts for this by controlling for, *e.g.*, rates of traffic offenses. Indeed, the sole authority Defendants cite concerning an attempt to show discrimination in roadblock placement specifically faulted the plaintiff for failing to conduct the very sort of analysis performed here by Dr. Ricchetti—*i.e.*, a statistical analysis that would “show[] that there was an[] effort to focus checkpoints on areas more densely populated by Hispanics than any other area of the County.” *Johnson*, 122 F. Supp. 3d at 360.²⁶

Finally, Defendants argue that Dr. Ricchetti’s analysis is flawed because certain roadblocks are located on or near the border of two census tracts and cannot be reliably assigned to one tract or the other. Opp. 19. As Dr. Ricchetti explains, however, this is immaterial; Dr. Ricchetti’s results hold regardless of whether the roadblocks located near census tract boundaries are eliminated from the data set, and even if all such data points are assigned to the census tract with the *lower* Black population. Ex. 1, Ricchetti R.R. ¶¶ 61-67; Ex. 3, Frontiera R.R. ¶¶ 87-88.

(b) Criticisms Of Dr. Guha’s Data Lack Merit

The data summarized in the Fed. R. Evid. 1006 declaration of Dr. Rahul Guha demonstrates that the MCSD arrests and cites Black persons far more than white persons, even though only 38% of Madison County’s population is Black. *See* Br. 10-11 (detailing citation and arrest data). This data is consistent with, and corroborates, Plaintiffs’ contentions regarding existence the MCSD’s Policing Program, just as hypothetical data that showed the MCSD arrested Black persons at rates that were proportionate to, or lower than, their share of Madison

²⁶ Instead of conducting an analysis comparable to Dr. Ricchetti’s, the plaintiff in *Johnson* compared census data to aggregated race data taken from forms that recorded race only for those persons who were “detained beyond the initial questioning at the checkpoint.” 122 F. Supp. 3d at 360. In finding this analysis unpersuasive, the court also noted that the analysis did not “allow[] for a comparison of violating and non-violating Hispanics to violating and non-violating non-Hispanics who passed through the checkpoints.” *Id.* Defendants’ other authority, *Chavez v. Illinois State Police*, 251 F.3d 612, 645 (7th Cir. 2001), is inapposite. It did not address roadblock or checkpoint placement, and instead merely stands for the proposition that census data for a particular location says little about the population of motorists encountered by the state highway patrol on interstate highways. *Id.*

County's population could provide evidence of an absence of discrimination.

Defendants attack the data "because Dr. Guha did not even attempt to control for any other factors," Opp. 13, and assert that "parties may not prove discrimination" through data or statistical analyses that do not "address the crucial question of whether one class is being treated differently from another class that is otherwise similarly situated." *Id.* (citing *Johnson*, 122 F. Supp. 3d at 363). *Johnson*, however, is a post-trial ruling in a non-class action, not a ruling on class certification, and it focuses entirely on whether such data can constitute sufficient proof of discrimination at trial, not on whether it is relevant to commonality at class certification. Plaintiffs do not have to prove their claims at the class certification stage. *See, e.g., Stockwell v. City & Cty. of San Francisco*, 749 F.3d 1107, 1115-16 (9th Cir. 2014) (the fact that plaintiffs did not "conduct a regression analysis to take account of alternative explanations ... for any statistical imbalance" was not grounds to deny certification; such potential alternative explanations merely presented common questions to be resolved on the merits). The statistical imbalances identified in the data summarized by Dr. Guha, coupled with Dr. Ricchetti's rigorous statistical analysis and the extensive anecdotal and documentary evidence submitted by Plaintiffs, provide significant proof of the challenged policy and thus support class certification.

Defendants also attack Dr. Guha's calculations as unsound, yet, as set forth in greater detail in Plaintiffs' opposition to Defendants' motion to exclude Dr. Guha's declaration, Defendants offer no support for the contention that Dr. Guha's tabulations are misleading or inaccurate. Defendants also do not appear to contest that significant racial disparities in fact exist in the MCSD's arrest and citation rates. And even if the Court were to accept Defendants' arguments regarding the alleged issues with Dr. Guha's calculations (it should not), that would

do little to shrink the obvious disparity in arrest and citation rates between races.²⁷

4. Defendants' Assertions Concerning MCSD Roadblocks Fail

There is substantial evidence that the MCSD disproportionately deploys roadblocks in Black neighborhoods and employs roadblocks for purposes of general crime control. Defendants do not seriously contend that the MCSD's deployment and operation of such roadblocks is not official policy. Instead, Defendants argue that roadblock placement is the result of non-discriminatory targeting of areas "where bars stay open late at night" (Opp. 17) and of responding to requests from managers of majority-Black apartment complexes (*id.* 22). These contentions lack merit, but need not be definitively resolved at class certification. Whether (and why) Defendants disproportionately target Madison County's Black community is a common question whose answers will drive the resolution of Plaintiffs' claims. So, too, will resolution of the question of whether such roadblocks are established for general crime control purposes.

Defendants contend in opposition that "all checkpoints in Madison County are conducted for traffic safety," primarily citing self-serving declarations by MCSD personnel. Opp. 19.²⁸ Defendants ignore other MCSD testimony indicating that the MCSD establishes roadblocks for general crime prevention.²⁹ Defendants also concede that the MCSD establishes roadblocks at

²⁷ For instance, Defendants fault Dr. Guha's tabulation for allegedly "double counting" arrests and failing to account for "non-discretionary" arrests such as warrant-based arrests. *See* ECF No. 273 at 15-16. But Defendants cite no research or data, and do not even try to establish how any of these other purported factors might somehow affect one race more than another. In any event, determining the actual effect of such non-race factors on the MCSD's arrest and citation rates clearly presents a common question of fact.

²⁸ Defendants claim that the "primary purpose of checkpoints is to enforce DUI laws." Yet Defendants' policy manual contains both "Sobriety Checkpoint Guidelines" and a vague "General Roadblocks" policy authorizing "general roadblocks when necessary to check for traffic violations, escapees, or wanted subjects ..." PX 89, MC-RFP 2-1 at 2-1, 2-4, § IX(c). Defendants assert there is no difference between sobriety and patrol checkpoints (Opp. 20), but MCSD personnel testified otherwise. *See, e.g.*, PX 25, Waldrop Tr. 40:5-12 (sobriety checkpoints are for "looking for DUIs"; general roadblocks are for "making sure that the drivers...got a good driver's license and so forth."); Ex. 5, Chandler Tr. 52:5-54:19 (a general roadblock is "a checkpoint for other violations or laws being broken other than sobriety").

²⁹ *See, e.g.*, PX 16, T. Jones Tr. 227:19-24 (as Captain of Narcotics, he set up roadblocks "for a crime

the entrances and exits to majority-Black apartment complexes in Madison County, but claim that these are also solely for traffic control, despite evidence of other purposes. *See, e.g.*, PX 91, MC-RFP-Inc. Rep. 010886 (MCSD “established a safety checkpoint at [the Canton Estates apartment complex] to check for out standing [sic] warrants and other violations.”). The NET Team—which Defendants admit enforces criminal law (Opp. 22)—also conducts roadblocks at these apartment complexes. *See* PX 20, D. Smith Tr. 65:25-67:2 (recalling conducting such roadblocks as a “deterrent to crime”).³⁰ Defendants even admit that NET Team personnel will “stop pedestrians at checkpoints” at these apartments to prevent them from “committing crimes.” Opp. 26. This, along with Plaintiffs’ other evidence, more than suffices to demonstrate important common questions regarding the constitutionality of the MCSD’s roadblocks.

Defendants also list a host of alleged roadblock procedures (Opp. 23-25), but there is limited evidence that these are actually followed. For example, Defendants state that blue lights must be activated, but numerous Plaintiffs and class members have described roadblocks in Black neighborhoods with no lights and unmarked cars.³¹ Whether adequate procedures actually exist is another common question.

deterrent”); PX 22, R. Thompson Tr. 20:19-21:13 (agreeing that “general crime prevention” is the “primary purpose” of roadblocks); PX 19, Squires Tr. 171:10-172:4 (detering crime is “definitely” a purpose); PX 17, Moore Tr. 159:2-4 (“Q. ... [W]hat’s the purpose of a roadblock? A. To prevent crime.”); PX 20, D. Smith Tr. 45:18-46:7 (NET team employs roadblocks to counter “high crime”).

³⁰ The testimony of Angela Lyons does not demonstrate that MCSD roadblocks are established at her request to combat speeding. Opp. 22. It does not mention roadblocks, but merely asserts that Ms. Lyons has observed drivers speeding and might mention the issue to “[t]he chief,” if “[she’s] talking to him.” DX1, Lyons Tr. 52:53. (The other cited page of Ms. Lyon’s testimony discusses a request for extra patrols to deter criminal activity. *See* Lyons Tr. 101.) Indeed, Ms. Lyons testified that, to her knowledge, the first time she had asked MCSD to set up a roadblock was in an October 31, 2017 letter. Ex. 7, Lyons Tr. 104:3-5. That letter noted “heavier traffic than normal”; loitering; marijuana use; and potential narcotics activity on the property, and requested patrols and “a random road block” as “preventative measure[s].” PX 90.

³¹ *See, e.g.*, PX 42, R. Davis Decl. ¶ 3 (“A typical roadblock is at least four officers with cars pulled over to the side of the road with the lights off. Then the officers stand in the middle of the road and shine their flashlights into drivers’ cars.”); PX 56, Q. Smith Decl. ¶ 3 (“MCSD parks off of the road and turns off all lights on their trucks.”); PX 41, Carter Decl. ¶ 2 (same); PX 39, A. Brown Decl. ¶ 3 (same).

5. Defendants' Contentions Regarding Pedestrian Stops Lack Merit

Defendants also do not seriously dispute that the MCSD has a specific policy of conducting vehicular and foot patrols in and around majority-Black apartment complexes. *See* Opp. 26-27. This policy is enacted chiefly through a “special team of MCSD officers” known as the “apartment detail” and, at present, the “NET Team” (Opp. 22), and known to the community as “jump out boys.” PX 20, D. Smith Tr. 79:5-15. These units have conducted hundreds of so-called “apartment walkthroughs” since Sheriff Tucker took office. PX 2, Guha Decl. ¶¶ 33-34.

Plaintiffs have presented substantial evidence that these patrols regularly involve suspicionless investigatory stops and detentions of pedestrians in which MCSD personnel demand identification and run warrant checks, and that when pedestrians attempt to avoid these encounters, they are met with pursuit, arrest, and charges for failure to comply. *See* Br. 20-22 & nn. 32-34. While Defendants have previously attempted to defend these stops as “consensual” encounters that do not implicate the Fourth Amendment, Defendants now assert that “[i]t is the policy of the MCSD that an officer can stop a pedestrian and ask them for their identification if they have reasonable suspicion or probable cause to believe they are engaged in criminal activity,” and that “MCSD officers understand that they must have reasonable suspicion or probable cause before stopping a pedestrian for questioning.” *Compare* PX 15, Howard Tr. 117:4-9, 125:8-9, 128:11-13, 139:7-8 *with* Opp. 27-28. Whether the MCSD’s Pedestrian Stop Program in fact comports with the Fourth Amendment is a common question that will drive resolution of the claims of the Pedestrian Subclass.

IV. THE TYPICALITY REQUIREMENT IS SATISFIED

The Fourteenth Amendment claims of the Targeting Class, whether concerning roadblocks, pedestrian stops, or other policing practices, all arise from the MCSD’s racial profiling and targeting of Black persons in Madison County. This common course of conduct

results in systematic civil rights violations, and the Named Plaintiffs' claims are typical of class member claims seeking to redress such violations. Indeed, Defendants hardly bother to deny that they target Black communities, and instead argue that the MCSD's decision to do so is a "political question" that can only be redressed by Madison County voters. Opp. 60 (asserting that Plaintiffs cannot obtain a judgment "that the Constitution mandates a particular allocation of resources and a particular pattern of conduct"). This, of course, is wrong; the Constitution mandates that state actors enforce state law in a non-discriminatory manner, and the procedural mechanism of Rule 23(b)(2) was designed to facilitate resolution of such claims.

The claims of the Roadblock Subclass and the Pedestrian Stop Subclass arise under both the Fourth and Fourteenth Amendments. Defendants, again, do not seriously contend that the Named Plaintiffs' claims are not typical of the claims of these subclasses. Instead, Defendants restate the arguments, set forth in their summary judgment motions, that the MCSD practices at issue do not violate the Constitution. These arguments fail for the reasons set forth in Defendants' consolidated opposition to those motions. In any event, they in no way suggest that the roadblock and pedestrian stop claims asserted by the proposed representatives of those subclasses are not typical, nor do they identify any unique defenses. They do nothing more than reassert Defendants' merits contentions, which does not defeat certification.

Defendants' arguments against the individual claims asserted by the other Named Plaintiffs are also unavailing. As Plaintiffs have explained, the warrantless search of Steven Smith's and Latoya Brown's apartment does not fall within the scope of the exigent circumstances or emergency aid doctrines because those doctrines do not authorize indiscriminate searches of entire apartment complexes, and require any search conducted under their aegis to be strictly limited to the circumstances justifying the exception. Dkt. 261, 67-71.

The forced entry into Lawrence Blackmon's home and his subsequent wrongful detention far exceeded parameters of Fourth Amendment reasonableness. *Id.* 83-88. And Defendants do not even attempt to argue that the ordeal endured by Khadafy and Quinnetta Manning complied with the Fourth Amendment. What connects these claims, and makes them typical of the Targeting Class, is the fact that Defendants' Policing Program, not any alleged violation of the law by the Named Plaintiffs, was the cause of the civil rights violations at issue. None of these Named Plaintiffs were ever charged with any offenses in connection with any of the incidents at issue. Instead, they were victimized by the MCSD as a result of Defendants' disproportionate and aggressive policing of Madison County's Black communities. As such, while the specific facts of these incidents may differ, the Named Plaintiffs' claims all derive from the same legal theory, satisfying the typicality requirement. *See James v. City of Dallas*, 254 F.3d 551, 571 (5th Cir. 2001) ("If the claims arise from a similar course of conduct and share the same legal theory, factual differences will not defeat typicality.").

V. THE ADEQUACY REQUIREMENT IS SATISFIED

Defendants raise three challenges to adequacy, each of which solely concerns purported conflicts within the proposed class and subclasses. First, Defendants contend that the fact that Plaintiffs are not attempting to pursue damages claims on behalf of the class creates a conflict. Second, Defendants argue that two named Plaintiffs have different incentives due to their individual claims against the John Doe defendants. Third, Defendants assert that unnamed class members actually support the challenged policing policies. None of these arguments has merit.

A. The Absence Of Class Damages Claims Does Not Create a Conflict

Defendants contend that a conflict exists because Plaintiffs are "willing[] to abandon damages claims which class members may wish to assert." Opp. 54. While Defendants characterize Plaintiffs as having "abandoned" or "disavowed" purported class claims for

damages, no such claims were ever asserted. Instead, Defendants argue that class representatives who seek certification of Rule 23(b)(2) classes will always be inadequate class representatives because litigation of the class claims for declaratory and injunctive relief might have res judicata impacts on the hypothetical individual damages claims of unnamed class members.

Defendants base their argument on a handful of employment discrimination cases in which plaintiffs asserted claims for both injunctive relief and damages, and then attempted to disavow their damages claims in order to obtain certification under Rule 23(b)(2).³² These cases, however, stand for the limited principle that Rule 23(b)(2) certification may be inappropriate in cases in which damages claims naturally predominate—not that res judicata concerns regarding hypothetical individual damages claims are grounds for routine denial of certification of Rule 23(b)(2) classes. To the contrary, the Fifth Circuit and other appellate courts have held that a class action seeking only declaratory and injunctive relief does not bar subsequent individual damages suits by class members.³³ Defendants, again, cite no cases in which certification of Fourth or Fourteenth Amendment class under Rule 23(b)(2) was denied on such grounds. *See Morrow*, 277 F.R.D. at 204 (class adjudication “should not foreclose an individual lawsuit for damages based on the individual circumstances of a particular stop”); *Ortega-Melendres*, 836 F. Supp. 2d at 991 (“even when they contain ancillary damages claims,” Rule 23(b)(2) class actions

³² *See McClain v. Lufkin Indus., Inc.*, 519 F.3d 264, 283 (5th Cir. 2008) (affirming denial of certification where “individual claims for monetary relief would have predominated”); *Zachery v. Texaco Expl. & Prod., Inc.*, 185 F.R.D. 230, 245-46 (W.D. Tex. 1999) (declining to certify employment discrimination class where “[f]ull monetary relief, if the Plaintiffs’ allegations are true, is readily available in this case”). *Slade v. Progressive Sec. Ins. Co.*, 856 F.3d 408, 413-14 (5th Cir. 2017), cited by Defendants, involved a Rule 23(b)(3) damages class with mandatory notice, not, as here, a Rule 23(b)(2) class.

³³ *See, e.g., Johnson v. Gen. Motors Corp.*, 598 F.2d 432, 437 (5th Cir. 1979) (Rule 23(b)(2) class member’s damages claims not barred by res judicata); *Bogard v. Cook*, 586 F.2d 399, 408-09 (5th Cir. 1978) (precluding individual damages claims “would be a harsh and improper application of res judicata”); *see also Hiser v. Franklin*, 94 F.3d 1287, 1291 (9th Cir. 1996); *Fortner v. Thomas*, 983 F.2d 1024, 1031 (11th Cir. 1993); *Norris v. Slothouber*, 718 F.2d 1116, 1117 (D.C. Cir. 1983); *Crowder v. Lash*, 687 F.2d 996, 1008-09 (7th Cir. 1982); *Jones-Bey v. Caso*, 535 F.2d 1360 (2nd Cir. 1976).

“have been found not to bar subsequent damages claims by class members ...”).³⁴

B. The Mannings’ Individual Damages Claims Do Not Impair Adequacy

Defendants next assert, without citing any authority, that Khadafy Manning and Quinnetta Manning are inadequate class representatives because they “can lose on every one of the common issues and still recover compensatory and punitive damages against the individual deputies,” and thus have “little incentive zealously to pursue” their class claims. Opp. 56. This argument is meritless. Prevailing on individual damages claims will not afford any measure of the declaratory and injunctive relief sought against the municipal defendants, so these two Plaintiffs have the same incentives to prosecute the class claims as the other Named Plaintiffs.³⁵

C. No Other Conflict Exists Within The Class

Finally, Defendants assert that an intra-class conflict exists because “[a]ctivity by the MCSD in Black neighborhoods is perceived by many residents as a welcome provision of protection.” Opp. 56. This argument fails both because Defendants lack evidentiary support and because their argument attacks a straw man. This case does not present the question of whether the MCSD should “protect [potential class members] and their communities” (Opp. 60), but rather, whether aspects of the MCSD’s policing violate the Fourth and Fourteenth Amendments.

³⁴ See also *In re TFT-LCD (Flat Panel) Antitrust Litig.*, 2012 WL 273883, at *2 (N.D. Cal. Jan. 30, 2012) (“[I]t makes little sense to turn the mandatory nature of the (b)(2) class into a feature that counsels against certification. Instead, it is better seen as consistent with the prevailing view that (b)(2) classes are limited in the degree to which they may bind their members.”); *Coleman v. Gen. Motors Acceptance Corp.*, 220 F.R.D. 64, 84 (M.D. Tenn. 2004) (“Defendant’s due process argument is ultimately an indictment of the Rule 23(b)(2) mechanism.... Because the authority suggests that future individual damages claims will not be barred, the defendant’s adequate representation and due process concerns are not well-founded.”).

³⁵ See *Ingles v. City of New York*, 2003 WL 402565, at *6 (S.D.N.Y. Feb. 18, 2003) (rejecting argument that “proposed class representatives do not fairly and adequately represent the class because they seek individual damages along with class-wide injunctive relief” where class representatives would “benefit from injunctive relief” to the same extent as other class members); *Johnson v. Am. Credit Co. of Georgia*, 581 F.2d 526, 529, 532 (5th Cir. 1978) (plaintiff who also sought individual damages was adequate representative of Rule 23(b)(2) injunction-only class); *Butler v. Illinois Bell Tel. Co.*, 2008 WL 474367, at *6 (N.D. Ill. Feb. 14, 2008) (same; collecting cases).

If class members' general reliance on the police for protection was evidence of support for any and all policing practices, no class could ever be certified in a policing case.

Despite asserting that "many class members plainly support" the MCSD policies challenged by Plaintiffs, Defendants solely cite testimony from two apartment managers, Angela Lyons and Perie Freeman, and from M/Sgt. Darian Smith of the NET Team. Ms. Lyons states that she has requested MCSD patrols in the past, and that apartment managers invite MCSD officials to an annual lunch, while Ms. Freeman states that she views MCSD patrols favorably. DX 1, Lyons Tr. 68-69, 107; DX 2, Freeman Tr. 50. Neither Ms. Lyons nor Ms. Freeman live in the apartment complexes they manage, and there is no support for Defendants' apparent contention that a landlord's or property manager's cooperation with law enforcement somehow creates a fatal conflict within a proposed class that includes their tenants. M/Sgt. Smith is cited for the statement that residents of majority-Black apartment complexes "have complimented us, telling us how much they appreciate us being there" (DX 3, D. Smith Tr. 122), but this is nothing more than vague, self-serving hearsay. Defendants fail to provide any evidence of community support, much less evidence of support for the MCSD's unconstitutional policies, and cannot defeat class certification through speculation.³⁶ The cases Defendants cite demonstrate that a concrete conflict must exist for denial of certification to be appropriate,³⁷ and no such evidence

³⁶ See, e.g., *Serna v. Transp. Workers Union of Am., AFL-CIO*, 2014 WL 7721824, at *5 (N.D. Tex. Dec. 3, 2014) ("[S]peculation ... cannot alone disprove the adequacy requirement."); 5 JAMES WM. MOORE ET AL., *MOORE'S FEDERAL PRACTICE* § 23.25(2)(b)(ii) (3d ed.) ("[T]o render a named representative an inadequate representative, the conflict must be more than merely speculative or hypothetical.").

³⁷ In *Bailey v. Ryan Stevedoring Co.*, 528 F.2d 551 (5th Cir. 1976), 204 of the 230 members of the proposed class submitted a petition opposing the claim. In *Alston v. Virginia High Sch. League, Inc.*, 184 F.R.D. 574, 579 (W.D. Va. 1999), there was "unrebutted evidence" that "[a] majority of female public school athletes surveyed expressed a desire to preserve the status quo." And in *Peterson v. Oklahoma Hous. Auth.*, 545 F.2d 1270 (10th Cir. 1976), the defendants presented evidence that many of the proposed class members believed that the security deposit at issue was beneficial. To the extent Defendants contend that *Horton v. Goose Creek Ind. Sch. Dist.*, 690 F.2d 470 (5th Cir. 1982), precludes certification on issues of remedy based on mere speculation as to future disagreements (Opp. 59-60), that

exists here. To the contrary, the only record evidence from class members is that presented by Plaintiffs and the 25 declarants who submitted written testimony in support of this motion.³⁸

VI. RULE 23(b)(2) IS SATISFIED

Lastly, Defendants claim that Plaintiffs fail to satisfy Rule 23(b)(2) because Rule 23(b)(2) requires “uniformity of harm,” which they claim (i) cannot exist under the Fourth Amendment because “very little is uniform about [its] operation,” and (ii) cannot exist under the Fourteenth Amendment because a policy of racial discrimination “might ... not inflict uniform injury, or any injury” to particular class members. Opp. 60-62. Defendants also argue that the injunctive relief requested by Plaintiffs is insufficiently specific. *Id.* Both of these arguments fail.

Defendants’ “uniformity of harm” argument would, if accepted, preclude certification merely because unconstitutional policies may have impacted class members differently. As Defendants’ primary authority, *Maldonado v. Ochsner Clinic Found.*, 493 F.3d 521 (5th Cir. 2007) itself demonstrates, Rule 23(b)(2) requires only that the harm at issue be redressable through an indivisible injunction rather than relief tailored to individual class members.³⁹

Injunctions in civil rights classes do not require “an individualized assessment of the injunctive relief afforded to each class member.” *Morrow*, 277 F.R.D. at 199 (distinguishing *Maldonado*). Courts, instead, can readily craft indivisible, class-wide injunctive relief that, as in *Morrow*, “would focus on ending [the defendants’] allegedly discriminatory interdiction program and

argument is erroneous; *Horton* turned on its specific facts and announced no such rule, and any conflicts hypothetically arising at later stages of this case can and should be dealt with at that time.

³⁸ These declarations, which Defendants completely ignore, also refute Defendants’ argument that the presence of only eight Named Plaintiffs in this suit is evidence of a lack of community support. *See* Opp. 57. In any event, many if not most class actions that are certified have eight or fewer class representatives.

³⁹ *Maldonado* involved a proposed injunction that would require the defendant to provide every class member “mutually affordable health care,” which the court found would require “an individual inquiry that will depend on the specific circumstances of each class member.” 493 F.3d at 524.

putting safeguards in place to monitor future stops to make racial profiling less likely.” *Id.*⁴⁰

Defendants’ argument that Plaintiffs’ proposed injunctive relief constitutes an “unenforceable ‘obey the law’ injunction” also misses the mark. The prayer for relief in Plaintiffs’ Complaint seeks an injunction that would, *inter alia*, (i) enjoin the specific unconstitutional policies at issue; (ii) implement training, monitoring, record keeping, and disclosure requirements that will function as safeguards against future constitutional violations; and (iii) establish an independent civilian review board. *See* Compl. 83-85. Nothing about this is improperly vague, and in any event “the real issue ... is not whether Plaintiffs have precisely defined the requested injunction at the class certification state, but whether the class is sufficiently cohesive that classwide injunctive relief can satisfy the limitations of Federal Rule of Civil Procedure 65(d).” *Morrow*, 277 F.R.D. at 198. The injunctive relief outlined in the Complaint is entirely consistent with forms of injunctive relief entered by courts in similar actions, and is more than sufficient to satisfy the requirements of Rule 23(b)(2).⁴¹

CONCLUSION

For all these reasons, this Court should grant Plaintiffs’ Motion for Class Certification.

Dated: July 2, 2018

By: /s/ Joshua Tom
Joshua Tom

⁴⁰ *Palmer v. Thompson*, 391 F.2d 324 (5th Cir. 1967) (Opp. 62), concerned whether proposed non-incarcerated class representatives had standing to challenge jail segregation. It did not cite Rule 23(b)(2) and its holding in no way implies that Rule 23(b)(2) requires all class members to have identical injuries.

⁴¹ *See, e.g., Milliken v. Bradley*, 433 U.S. 267, 276 (1977) (requiring training for teachers and administrators as part of school desegregation injunction); *Melendres v. Arpaio*, 784 F.3d 1254, 1266 (9th Cir. 2015) (affirming injunction requiring training, data collection and recordkeeping, and appointment of a monitor, as well as prohibitions against profiling and enforcing challenged policies); *United States v. City of Parma*, 661 F.2d 562, 577 (6th Cir. 1981) (affirming injunction requiring public relations campaign to correct municipality’s image “as a closed community” and creation of committee to dissipate “tension and resentment”); *Floyd v. City of New York*, 959 F. Supp. 2d 668, 677-84 (S.D.N.Y. 2013) (requiring reforms to policies, training, supervision, monitoring, discipline, and documentation, and community input); *Morrow*, 277 F.R.D at 199 (contemplating injunction to end discriminatory program and implement safeguards); *McClain v. Lufkin Indus., Inc.*, 2010 WL 455351 (E.D. Tex. Jan. 15, 2010) (establishing training, monitoring, and recordkeeping requirements and appointing ombudsperson).

SIMPSON THACHER & BARTLETT LLP

Jonathan K. Youngwood (*pro hac vice*)
Janet A. Gochman (*pro hac vice*)
Isaac Rethy (*pro hac vice*)
Kavitha S. Sivashanker (*pro hac vice*)
Nihara K. Choudhri (*pro hac vice*)
Christopher K. Shields (*pro hac vice*)
Brooke Jarrett (*pro hac vice*)
425 Lexington Avenue
New York, NY 10017
(212) 455-2000
jyoungwood@stblaw.com
jgochman@stblaw.com
irethy@stblaw.com
kavitha.sivashanker@stblaw.com
nchoudhri@stblaw.com
christopher.shields@stblaw.com
bonnie.jarrett@stblaw.com

AMERICAN CIVIL LIBERTIES UNION
OF MISSISSIPPI FOUNDATION

Joshua Tom (Miss. Bar No. 105392)
233 East Capitol Street
Jackson, MS 39201
(601) 354-3408
JTom@aclu-ms.org

AMERICAN CIVIL LIBERTIES UNION
FOUNDATION

Ezekiel Edwards (*pro hac vice*)
Jeffery Robinson (*pro hac vice* forthcoming)
125 Broad Street
New York, NY 10004
(212) 549-2610
eedwards@aclu.org
jrobinson@aclu.org

Attorneys for Plaintiffs

CERTIFICATE OF SERVICE

I hereby certify that on July 2, 2018, I caused the foregoing **REPLY MEMORANDUM OF LAW IN FURTHER SUPPORT OF PLAINTIFFS' MOTION FOR CLASS CERTIFICATION** to be electronically filed with the Clerk of the Court using the CM/ECF system, through which copies have been served to:

WISE CARTER CHILD & CARAWAY, P.A.
Michael B. Wallace (Miss. Bar No. 6904)
Charles E. Ross (Miss. Bar No. 5683)
James E. Graves (Miss. Bar No. 102252)
Charles E. Cowan (Miss. Bar No. 104478)
T. Russell Nobile (Miss. Bar No. 100682)
Post Office Box 651
Jackson, MS 39205
(601) 968-5534
mbw@wisecarter.com
cer@wisecarter.com
jeg@wisecarter.com
cec@wisecarter.com
trn@wisecarter.com

CURRIE JOHNSON & MYERS, P.A.
Rebecca B. Cowan (Miss. Bar No. 7735)
P.O. Box 750
Jackson, MS 39205
(601) 969-1010
bcowan@curriejohnson.com

KATIE BRYANT SNELL, PLLC
Katie Bryant Snell (Miss. Bar No. 103607)
P.O. Box 3007
Madison, Mississippi 39130-3007
(601) 460-9800
Katie@katiebryantnell.com

PETTIS, BARFIELD & HESTER, P.A.
J. Lawson Hester (Miss. Bar No. 2394)
Jason E. Dare (MSB No. 100973)
4450 Old Canton Road, Suite 210
Jackson, Mississippi 39211
(601) 987-5300
lhester@pbhfirm.com
jdare@pbhfirm.com

/s/ Joshua Tom

Joshua Tom

EXHIBIT 1

**UNITED STATES DISTRICT COURT
FOR THE SOUTHERN DISTRICT OF MISSISSIPPI
JACKSON DIVISION**

LATOYA BROWN; LAWRENCE
BLACKMON; HERBERT ANTHONY
GREEN; KHADAFY MANNING;
QUINNETTA MANNING; MARVIN
MCFIELD; NICHOLAS SINGLETON;
STEVEN SMITH; BESSIE THOMAS; and
BETTY JEAN WILLIAMS TUCKER,
individually and on behalf of a class of all
others similarly situated,

Plaintiffs,

v.

MADISON COUNTY, MISSISSIPPI;
SHERIFF RANDALL S. TUCKER, in his
official capacity; and MADISON COUNTY
SHERIFF'S DEPUTIES JOHN DOES #1
through #6, in their individual capacities,

Defendants.

Civil Action No.

3:17-cv-00347-WHB-LRA

REBUTTAL EXPERT REPORT OF BRYAN RICCHETTI, Ph.D.

July 2, 2018

Table of Contents

1. SUMMARY OF FINDINGS	2
2. DR. STEWARD MISUNDERSTANDS KEY FEATURES OF MY ANALYSIS, WHICH IS BASED ON METHODS WIDELY USED IN THE ACADEMIC LITERATURE	5
<i>2.1. My model controls for relevant driving behavior of motorists in census tracts</i>	<i>6</i>
<i>2.2. The role of the race variable in my model.....</i>	<i>10</i>
<i>2.3. Dr. Steward misinterprets the size of the race coefficient in my model.....</i>	<i>12</i>
<i>2.4. The general methodology I use has been used in published papers studying racial profiling, and in papers studying discrimination more generally</i>	<i>14</i>
<i>2.5. Dr. Steward overstates the role of factors not included in my model.....</i>	<i>19</i>
<i>2.6. Dr. Steward misrepresents my descriptive analysis, and incorrectly claims that I do not perform tests of statistical significance</i>	<i>20</i>
3. DR. STEWARD'S ANALYSIS OF THE GEOCODING DATA IGNORES BASIC ECONOMETRIC PRINCIPLES	22
<i>3.1. Measurement error is a well-recognized feature of many regression models, and is only a problem if the error is correlated with the variable of interest.....</i>	<i>24</i>
<i>3.2. When I apply standard sensitivity tests for roadblocks that are near the boundary of census tracts, my findings are unchanged</i>	<i>27</i>
4. CONCLUSION	30

1. SUMMARY OF FINDINGS

1. Since filing my initial report on March 13, 2018, I have reviewed the reports of Dr. Steward and Mr. Funderburk. In this report, I address the claims made in those two reports. In particular, I explain how Dr. Steward's claims that my methodology is unreliable stem from a misunderstanding of widely accepted econometric methods. As I detail below, this is evidenced by the fact that the methods I use are widely accepted in both academia and by the Courts. Further, Dr. Steward and Mr. Funderburk overstate the extent of certain data issues, and do not use widely accepted statistical methods to test whether my findings are sensitive to the various data issues they identify. As I show below, my results are robust to each of the claims made.

2. I begin my analysis in Section 2, where I address a variety of claims that Dr. Steward makes about the methodology of my model and its use in the academic literature. As I explain in that section, Dr. Steward misunderstands how my model works, and incorrectly asserts that my methodological approach is not used in the academic literature. The methodology I use has been used in published academic work and has been accepted by Courts. In fact, Dr. Steward has himself used the general methodology in prior work as an expert witness. Below is a summary of my key findings on these points:

- Dr. Steward claims that my model does not account for the driving population.¹ This is simply untrue. Consistent with the academic literature on policing that I cite to in my original report (and that Dr. Steward cites to in his report), my analysis controls directly for the population of motorists who most directly contribute to roadblock placement, using data from MCSD on DUIs and traffic violations. In fact, Dr. Steward asserts that "the key factor in MCSD traffic roadblock location placement" is DUI frequency of motorists, which is the central control variable in my model.² Yet despite the fact that DUI frequency

¹ Rebuttal Report of Dwight D. Steward, Ph.D. RE: Bryan Ricchetti, Ph.D., May 8, 2018 ("Steward Report"), ¶ 38.

² Steward Report, ¶¶ 54–61.

is included in my model, Dr. Steward incorrectly asserts that my model does not account for the driving population.³

- Dr. Steward also incorrectly asserts that I use the share of residents in each census tract that are Black as a measure of the share of drivers in each census tract who are Black.⁴ This reflects a misunderstanding of my model. As I explain below, the control variable for race in my model is included as a way to test whether roadblocks are more frequent in areas of Madison County with a higher fraction of Black residents, controlling for the level of risky driving behavior of the *motorists* in those areas. As I understand it, a central claim in this case is that residents in predominantly Black areas of Madison County claim that roadblocks and other policing activity disrupt their daily lives. The purpose of my model is to assess whether the frequency of roadblocks are more common in areas that have a higher share of Black residents after controlling for the relevant driving behavior of motorists. As I discuss below, this general modeling approach has been published in peer-reviewed journals in the academic literature to assess whether policing activity differs across neighborhoods with a higher share of Black residents, after controlling for relevant crime behavior. It has also been relied on by Courts. More generally, the type of regression model I use in my analysis is a fundamental tool in economics, and a widely accepted tool for examining claims of racial disparities in a wide variety of settings (e.g., crime, hiring/pay, poverty and employment outcomes, and housing market redlining).
- Dr. Steward also makes a basic arithmetic error when interpreting the size of the coefficient on race in my model. This error leads him to substantially understate the relationship between roadblock frequency and the share of the population that is Black across census tracts.
- Dr. Steward also claims that analyzing outcomes at the census tract level “undercuts reliability” and is not standard methodology.⁵ This is, again, untrue. Regression analyses that compare outcomes across geographic areas (like census tracts, counties, cities, states, etc.) have been widely

³ Steward Report, ¶¶ 47–48.

⁴ Steward Report, ¶ 36.

⁵ Steward Report, ¶ 46.

published in top academic journals, accepted by the Courts, and used to assess a wide variety of questions related to race, discrimination, public policy, and crime. Dr. Steward himself has used such methods as an expert, applying them to even larger geographic areas than census tracts. My use of census tract-level data is appropriate and reliable.

- Finally, Dr. Steward misrepresents and misunderstands the purpose of the descriptive statistics presented in my first report, asserting that I did not perform a test for statistical significance and that my results somehow depend on there being a specific racial threshold for alleged bias.⁶ This is untrue. The summary of descriptive statistics presented in my first report is designed to provide an overview of relevant patterns in how the racial population varies across areas of Madison County. As detailed below, starting an analysis with a descriptive summary of key variables is standard practice in peer-reviewed articles that use regression models. As I explained in my initial report, in order to do a proper statistical test of differences in roadblocks across census tracts with different racial breakdowns, a regression model is required. I present a series of regression models that offer such tests in my original report, and that impose *no assumption* on which census tracts have a high or low share of Black residents. The claim that I have not done a proper statistical test is incorrect.

3. In Section 3 of my report, I address the claims that Dr. Steward and Mr. Funderburk raise about the roadblock data. I make several points in that section:

- First, the fact that the data on roadblock location provided by MCSD includes the location of the intersection, rather than an exact address, is not by itself a problem for my analysis. The purpose of my analysis is to look at the frequency of roadblocks across census tracts. As Mr. Funderburk's own analysis shows, the vast majority of intersections in the MCSD data can be cleanly delineated into individual census tracts.⁷ As noted above, it is common in academic research to analyze patterns across different geographic units, like census tracts.

⁶ Steward Report, ¶ 64–65.

⁷ Expert Report of William R. Funderburk, May 8, 2018 ("Funderburk Report"), ¶ 57.

- Second, while Dr. Steward and Mr. Funderburk are correct that some roadblocks are located on the boundary of various census tracts, this fact does not render my analysis unreliable. Such measurement imperfections are a standard part of statistical and economics analysis, and are common in numerous published academic papers that analyze differences across geographic units in various outcomes using regression models. As I explain below, this common feature of data and regression analysis reflects one of the more basic econometric issues discussed in econometrics textbooks (known as “measurement error”), and is understood to typically make an analysis like mine *conservative* because it makes it *less likely* (not more) to find a statistically significant coefficient on the race variable. Further, it is well recognized that there are ways to test whether such measurement error would, in fact, bias my analysis and generate unreliable conclusions. Dr. Steward and Mr. Funderburk do not attempt to answer this question in any way.
- As I show below, when I use standard sensitivity analyses accepted in the academic literature, I show that my findings are unchanged. For example, as I show in Section 3, when my analysis focuses only on roadblocks not near the boundary, my main findings are unchanged. In fact, even if I assume that all of the roadblocks on a boundary occurred in the bordering census tract with the highest white population, my results hold. These tests demonstrate that the higher frequency of roadblocks in census tracts with a higher share of Black residents, found in my original analysis, is not a result of the roadblocks on the boundary between census tracts. Critically, neither Dr. Steward nor Mr. Funderburk offer any analysis to show that the location of certain roadblocks near census tract boundaries affect or change my results in any way.

2. DR. STEWARD MISUNDERSTANDS KEY FEATURES OF MY ANALYSIS, WHICH IS BASED ON METHODS WIDELY USED IN THE ACADEMIC LITERATURE

4. Dr. Steward fundamentally misunderstands the logic of my statistical analysis. Dr. Steward’s claims about my model can be grouped into several broad categories, each of which I address in this section.

2.1. My model controls for relevant driving behavior of motorists in census tracts

5. Multiple times in his report, Dr. Steward emphasizes the importance of controlling for the “driving population” on the road when building a statistical model of roadblock frequency.⁸ Dr. Steward and I are in agreement on this point – any analysis of roadblock placement must account for the driving behavior of the drivers in the area where roadblocks occur. Where Dr. Steward and I disagree is his claim that my statistical model somehow does not account for the driving population of motorists in Madison County relevant for determining roadblock placement.⁹

6. As I detail in my first report, the most important control variables in my model are the frequency of DUIs and traffic violations of drivers in each census tract. These variables are direct measures of the behavior of motorists in each census tract in Madison County. Indeed, in my initial report I explicitly discuss the importance of controlling for driving behavior and cite to the relevant literature.

“There is also a body of research literature focused on the specific question of differential policing and policing outcomes across race. That literature also emphasizes the importance of controlling for relevant, non-race factors when assessing claims of racial profiling or bias by police. For example, one study funded by the U.S. Department of Justice to help law enforcement officials and researchers better understand how to analyze data on race and vehicle stops notes ‘the strongest research methodologies will address the alternative hypothesis that racial/ethnic groups are not equivalent in the nature and extent of their traffic law-violating behavior.’

Another paper, which summarizes common statistical methods used for analyzing policing data, discusses the importance of controlling for “driving behavior that may be important sources for police decision-making, such as the likelihood of speeding, weaving through traffic, and driving slower than usual,” when analyzing traffic violations across race.”¹⁰

⁸ Steward Report, ¶¶ 36–39; 45–47.

⁹ Steward Report, ¶¶ 47–53.

¹⁰ Expert Report of Bryan Ricchetti, Ph.D., March 13, 2018 (“Ricchetti Report”), ¶¶ 18–20.

7. Despite the fact that I discussed these issues in my report and include in my model multiple measures of driving behavior (and explicitly discuss how those measures are the strongest variables in my model), Dr. Steward asserts that my model relies only on information about the “residential population” in each census tract.¹¹ As demonstrated above, this claim by Dr. Steward is simply untrue. The central control variable in my model is the frequency of DUIs of motorists in each census tract, which Dr. Steward acknowledges in his own report is “the key factor” in roadblock placement.¹²

8. In addition to directly controlling for the relevant driving behavior of motorists that give rise to roadblocks, I also include several control variables related to the population of residents in each census tract. As I explain in my report, I include these controls *in addition to* direct controls for motorists for two main reasons. One is to account for MCSD’s claim that the need for their policing resources varies across the county depending on the economic resources of the local police department.¹³ These variables are, thus, important to the model. Dr. Steward ignores my explanation of this issue. The second is to add *incremental* information to the model beyond direct measures of motorist behavior. This also consists of two variables – vehicle ownership and age – which, as noted in my first report, are understood to be correlated with driving behavior.¹⁴

9. As I explain more below in Section 2.4, the approach of using variables that control *both* for direct measures of crime occurring in a neighborhood and for the neighborhood characteristics is used in the academic literature. Further, as I show below in Section 2.5, even if I were to take Dr. Steward’s concerns at face value and exclude from my model information predictors about the driving behavior of *residents* in the neighborhood, the results of my model hold. It is notable that

¹¹ Steward Report, ¶ 36.

¹² Steward Report, ¶ 54.

¹³ Answer and Affirmative Defenses of Defendants, Madison County, Mississippi and Sheriff Randall C. Tucker, In His Official Capacity, *Latoya Brown; Lawrence Blackmon; Herbert Anthony Green; Khadafy Manning; Quinnetta Manning; Marvin McField; Nicholas Singleton; Steven Smith; Bessie Thomas; and Betty Jean Williams Tucker, individually and on Behalf of a class of all others similarly situated, v. Madison County, Mississippi; Sheriff Randall S. Tucker, in his official capacity; and Madison County Sheriff’s Deputies John Does #1 through #6, in their individual capacities*, CIVIL ACTION NO. 3:17-cv-347 WHB LRA, dated June 29, 2017, ¶¶ 9, 62.

¹⁴ Fridell, Lorie, “By The Numbers: A Guide for Analyzing Race Data from Vehicle Stops,” Police Executive Research Forum, pp. 79–82.

while Dr. Steward claims that the use of these variables in my report is a major problem, he does not offer any analysis or test to show that they affect my ultimate conclusions. As I note throughout this report, this is a common theme with his criticisms.

10. A related argument that Dr. Steward makes is that because my model does not include measures of bars or restaurants it cannot reliably control for risky driving behavior in each census tract.¹⁵ This argument again appears to misunderstand how the control variables in my model work. As noted above, Dr. Steward acknowledges that DUIs are “the key factor” in roadblock placement.¹⁶ Indeed, as Dr. Steward explains in his own report, the main reason one would want to control for the number of bars and restaurants in an analysis of roadblocks is because drunk driving and/or risky driving is more likely to occur in such areas. However, because my model already includes *direct controls* for drunk driving and traffic violations, adding in indirect measures for drunk driving (like concentration of bars and restaurants) would not be expected change the findings of the model because my model already accounts for these factors through DUIs. I discuss this issue further in Section 2.5 below.

11. In an attempt to support this claim that controlling for bars is important, Dr. Steward runs a version of my model in which he adds controls for boating areas and bars, and asserts that after making this change my model does not find a statistically significant relationship between the share of population that is Black and the frequency of roadblock.¹⁷ However, as I explain below, Dr. Steward’s analysis is flawed for at least two reasons, and when the flaws are corrected Dr. Steward’s own analysis finds the same results as mine. It shows that even when you control for his measures of boating areas and bars the statistically significant relationship between the share of population that is Black and the frequency of roadblocks remains.

¹⁵ Steward Report, ¶¶ 49–50.

¹⁶ See, for example, Steward Report, ¶ 11 (“... DUI activity and not race, is the key factor in MCSD traffic roadblock location placement.”); Steward Report, ¶ 58 (“It my understanding that MCSD receives grant funding from Mississippi Office of Highway Safety (MOHS) in its efforts to reduce the incidents of drunk driving and to assist with cost of establishing DUI traffic roadblocks. It is my understanding that the grant funding is subject to periodic renewal and is contingent on satisfactory achievement of DUI enforcement. Even a cursory look at the traffic roadblock and CAD data shows that the DUI activity in a geographical area during a specific time period is correlated with an increased number of traffic roadblocks in the geographical area in later time periods.”).

¹⁷ Steward Report, ¶ 75.

12. First, it is important to understand that Dr. Steward does not in fact include direct controls for the number of bars or restaurants in his model. Instead, he includes a set of “dummy” variables for certain census tracts that he asserts have relatively high or low density of bars. Such a methodology is less precise than using direct measures of DUIs because it cannot distinguish between the level of intensity of bars and/or unsafe driving across census tracts. It instead assumes there are only three types of areas – high, low, and normal.

13. Second, the only reason Dr. Steward finds a statistically insignificant relationship between the population that is Black and the frequency of roadblocks is because he throws out 80 percent of the data when he runs his analysis. Specifically, instead of running his sensitivity analysis on the full six years of data used in my analysis (126 data points), Dr. Steward runs a separate regression for each year from 2012-2017, each of which has only 21 data points.¹⁸ When I simply re-run his model using the full dataset I used in my analysis – including his controls for bars or boating areas – his model finds a *statistically significant* relationship between the share of the population that is Black and the frequency of roadblocks that is slightly *larger* in magnitude than my model.¹⁹ Similarly, if I simply take the average effect from his six regressions across all six years, it is also larger in magnitude than the effect in my model.

14. For example, in my original model, I find that the coefficient on the share of Black residents is 0.06218, which translates into 112 more roadblocks over the 6 years of data in a census tract that is 80% Black relative to one that is 20%.²⁰ Dr. Steward’s analysis yields a coefficient of 0.06565 averaged across all six years, which translates into 118 more roadblocks in a census tract that is 80% Black relative to one that is 20%.²¹ In other words, Dr. Steward’s analysis does not provide any evidence that accounting for bars or boating areas reduces the

¹⁸ Ricchetti Report, Exhibit 6 has 126 data points. As this is estimated over a six year period, a single year has 21 points.

¹⁹ See workpaper. The coefficient on the share of the population that is Black in Dr. Steward’s model (which controls for bar and boating areas) is 0.06268 when all data are included in the regression. In my original model, the coefficient is 0.06218.

²⁰ Ricchetti Report, ¶ 46.

²¹ See workpaper.

magnitude of the effect of race; Dr. Steward simply conducts an analysis with fewer data points that reduces the statistical power of the sample.

15. Finally, Dr. Steward claims my model suffers from something called simultaneity bias, because DUIs and roadblocks may be determined at the same time.²² As I discuss below, a common way to test for this concern in the academic literature is to use DUIs from the prior year as a control variable (referred to as a “lagged” variable in the literature).²³ The logic of this approach is straightforward – DUIs from the prior year are known at the time roadblocks in the current year are set up, whereas roadblocks from the current year cannot deter DUIs from the prior year. As shown in Exhibit 2, when I do this, my results continue to hold. This is another example of Dr. Steward claiming my model has a shortcoming that it does not have, without running any tests.²⁴

2.2. The role of the race variable in my model

16. Dr. Steward also incorrectly asserts multiple times in his report that my analysis uses the share of *residents* in a census tract who are Black as a substitute/proxy/replacement for the share of drivers on the road who are Black. As I explain here, my model makes no such assumption.

17. The purpose of including race in my model is to assess whether roadblocks are used more frequently in areas of the county that have a higher share of Black residents, after controlling for the driving behavior (e.g., DUIs) that are the main factor for roadblock placement. As I understand it, Plaintiffs claim in this case, among other things, that the MCSD disproportionately establishes roadblocks in particular residential neighborhoods, including in locations such as the entrances and exits of majority–Black housing complexes. Thus, I understand that a relevant

²² Steward Report, ¶ 74 (footnote 32).

²³ Fagan, Jeffrey, et al., “Street Stops and Broken Windows Revisited: The Demography and Logic of Proactive Policing in a Safe and Changing City,” Stephen K. Rice, and Michael D. White, (Eds.), *Race, Ethnicity, and Policing: New and Essential Readings*, New York University Press, New York and London, 2009, pp. 319–320. “First, in the figures, we use reported homicides in the police precinct in the preceding year as the measure of crime. This lagged function allows us to avoid simultaneity concerns from using contemporaneous measures of crime and police actions.”

²⁴ It is worth pointing out that even if one is concerned about potential simultaneity bias, it could actually cut in the opposite direction Dr. Steward claims, and make my analysis conservative. In particular, to the extent it is true that there is a higher roadblock presence in Black census tracts, this will cause a reporting difference in DUIs between different census tracts. That is, DUIs in white census tracts will be less likely to be caught. This would actually cause my analysis to under-estimate the relationship between the share of Black residents in a census tract and the frequency of roadblocks (relative to DUIs in those census tracts) because the model is missing relatively more information on DUIs in census tracts with a higher white population.

question is whether there are more/fewer roadblocks in certain areas of town than would otherwise be expected given the behavior of motorists in those areas.

18. As I explained previously, my model controls for the different driving behavior of *motorists* across census tracts using the DUI variable discussed above, and then asks the question: Given the differences in motorists' behavior, are roadblocks more frequent in areas with different racial populations? I am not in any way using the racial breakdown of residents as a proxy for the racial breakdown of motorists. I am instead using the racial breakdown of residents as a way to assess whether roadblocks are more or less frequent across different parts of Madison County, controlling for driving behavior.

19. Importantly, as I explain in the next section, the general statistical methodology of examining whether policing activities vary with the racial breakdown of a community (after controlling for relevant measures of crime in that community) has been used in published academic papers and accepted by the Courts.

20. In a somewhat related point, Dr. Steward also criticizes the fact that I normalize roadblocks and DUI's by population.²⁵ As noted above, because of the nature of the claims in this case, the number of roadblocks per person in different neighborhoods is an appropriate way to measure of any potential impact on residents. Additionally, as I discuss more below, peer-reviewed papers have used residential population in conjunction with direct measures of crime behavior.

21. Further, as with many of his other claims, Dr. Steward does not perform any tests to show that my use of population to normalize roadblocks has any effect on my analysis. I have. Specifically, to test whether Dr. Steward's criticism has merit, I have re-run my model without normalizing roadblocks, DUIs, and traffic violations by population. My main results are unchanged. See Exhibits 3 and 4 Appendix C. Again, Dr. Steward's criticism of my model without running even a very basic statistical test of whether the criticism affects my results is not the accepted method for analyzing whether a model's findings are sensitive to the

²⁵ Many of Dr. Steward's criticisms focus on the total number of roadblocks, rather than the number of roadblocks per 1,000 people in a census tract, as I focus on in my model. See, for example, Steward Report, ¶¶ 17, 37.

control variables included. If a researcher is concerned that a particular variable (or feature of a model) creates bias in an analysis, they can directly test their concern using sensitivity analysis.²⁶ Dr. Steward does not do this.

2.3. Dr. Steward misinterprets the size of the race coefficient in my model

22. Dr. Steward also presents the rather unorthodox argument that, even though the race variable in my model is statistically significant, the fact that it is smaller in magnitude than the DUI variable means that race is not relevant. In making this argument, Dr. Steward makes several basic interpretation errors, which lead him to both incorrectly calculate the effect that race has on the number of roadblocks, and incorrectly compare the relative impacts of race and DUIs on roadblock placement.

23. For example, Dr. Steward says, “if the African-American population of a census tract increased by 1% per year, then there would be 0.06 more roadblocks in that tract per year...it would take approximately sixteen (16) years for there to be an additional roadblock in that given tract.”²⁷ Dr. Steward’s statement includes several basic errors (both in interpretation and mathematical) that render it inaccurate.

24. First, Dr. Steward does not account for the fact that my model normalizes variables (including roadblocks, the outcome variable of my model) by population.²⁸ This means that my coefficient does not show the effect of race on total roadblocks, it shows the effect of race on roadblocks for every 1,000 residents. Given that the average census tract in Madison County has 5,000

²⁶ Wooldridge, Jeffrey M., *Introductory Econometrics: A Modern Approach*, 5th Edition, South-Western Cengage Learning, Mason, Ohio, 2012, pp. 684-685. (“If your model has some potential misspecification, such as omitted variables, and you use OLS, you should attempt some sort of misspecification analysis of the kinds we discussed in Chapters 3 and 5. Can you determine, based on reasonable assumptions, the direction of any bias in the estimators?... Good papers in the empirical social sciences contain sensitivity analysis. Broadly, this means you estimate your original model and modify it in ways that seem reasonable. Hopefully, the important conclusions do not change.”).

²⁷ Steward Report, ¶56.

²⁸ In deposition testimony, Dr. Steward stated that the roadblock variable in my model is the total number of roadblocks, rather than the number per 1,000 residents. This is incorrect, and was explained in my original report. See Deposition of Dwight Steward, Ph.D., June 22, 2018 (“Steward Deposition”), p. 256:6–12.

residents, Dr. Steward understates the effect of his example by a factor of 5.²⁹ Second, as I describe in my first report, the proper way to interpret my coefficient is to consider two census tracts with different shares of Black residents over the 6 years of data.³⁰ Dr. Steward's thought experiment, which considers how a census tract's race share might change over time, ignores the large variation in the Black share of the population which already exists across census tracts.

25. As is clearly explained in my original report, my model predicts that over a 6 year period there would be 112 roadblocks more in a census track that is 80% Black compared to one that is 20% Black, even after controlling for DUIs.

"The following example helps explain what the coefficient signifies. Suppose that we compare an area that was 20% Black to one that was 80% Black. The coefficient means that there would be 3.73 more roadblocks per 1,000 citizens on average in the area that was 80% Black.³¹ To put that into context, the average census tract in Madison County had about 5,000 people per year during the relevant period. For such an average census tract, if the percentage of Black residents is 80% instead of 20%, my model predicts that there will be over 18 more roadblocks per year (3.73 more roadblocks per 1,000 people is 18.65 total roadblocks), or about 112 more roadblocks in total over the 6 years of data I analyze."³²

²⁹ Dr. Steward makes another, unrelated, math error in the example he presents. He describes a census tract where the share of the population that is Black grows by one percentage point per year. To calculate the expected time it would take to generate an additional roadblock he erroneously divides 1 by 0.06, the effect of a one-point increase in the Black population. This calculation actually provides the length of time it would take to generate an extra roadblock per 1,000 people if the Black population increased by one point, once, and then remained at that level for 16 years (e.g. if the Black population increased from 50 to 51 percent and remained at 51 percent). If the Black population increased one point *each year*, as Dr. Steward describes in his example, the first year would have 0.06 additional roadblocks per 1,000 people. However, in the second year, the Black population would increase by an additional percentage point and would be two percentage points higher than in the base year resulting in approximately $0.06 \times 2 = 0.12$ roadblocks per 1,000 people in the second year alone. The result over 16 years would be more than 8 additional roadblocks per 1,000 people. The estimated coefficient suggests an average census tract, with a population of 5,000, would experience an increase of over 42 roadblocks over the 16-year period, not one roadblock as Dr. Steward claims. See *workpaper*.

³⁰ Ricchetti Report, ¶¶ 33, 46.

³¹ The effect of moving from an area that was 20% Black to one that was 80% Black in my model is equal to $(80 - 20) \times 0.06218$, which equals 3.7308.

³² Ricchetti Report, ¶ 46.

26. Third, Dr. Steward's errors in interpreting the race coefficient also lead him to make the erroneous statement that the effect of DUIs is 20 times greater than that of race.³³ When comparing the relative magnitude of two distinct coefficients, it is well recognized that it is important to make an "apples to apples" comparison in terms of units and effect size. The racial breakdown of the population and the number of DUIs per 1,000 people operate on different scales, and have very different underlying characteristics. A common approach for doing this is to ask what is the effect of changing different factors by one standard deviation. When I do this basic scaling exercise, the effect of DUIs is not 20 times greater – it is about 2 times greater.³⁴ Another related measure, which is favored by economists for being "unitless" – that is, for allowing natural comparisons across different types of different variables, regardless of their scales, is called "elasticity." When I compare the elasticities of DUIs and race in my model of roadblock placement, the effect of DUIs is only 1.16 times greater.³⁵

27. Finally, Dr. Steward does not offer an explanation or citation for his apparent contention that only the single variable that is the greatest in magnitude can have explanatory significance.³⁶ As I explain below, the purpose of a model like mine is to test whether race has a significant effect after accounting for non-race factors that might affect roadblocks. This is a common methodology in academic papers assessing racial disparities in outcomes. Dr. Steward's contention is similar to saying that because income is a well-known factor than can explain lending rates, race cannot be a significant factor as well. There is nothing to prevent both from being true, and any such claim would stand in direct contrast to the literature.³⁷

2.4. The general methodology I use has been used in published papers studying racial profiling, and in papers studying discrimination more generally

28. In an attempt to support his claims that my model is flawed, Dr. Steward asserts that my methodology is not used in the literature on policing and crime.³⁸

³³ Steward Report, ¶ 20.

³⁴ See workpaper.

³⁵ See workpaper.

³⁶ The supporting analysis Dr. Steward appears to offer on this point is at ¶¶ 59–61 of his report. There Dr. Steward presents analysis showing a relationship between roadblocks and DUIs. Such a relationship, however, does not preclude the possibility of an effect of the share of population that is Black on roadblock frequency, controlling for DUIs.

³⁷ Rougeau, Vincent D. and Keith N. Hylton, "Lending Discrimination: Economic Theory, Econometric Evidence, and the Community Reinvestment Act," *The Georgetown Law Journal*, 85(237), 1996, p. 290.

³⁸ Steward Report, ¶¶ 38–39.

Dr. Steward makes a few claims about how and why my model purportedly does not fit into the academic literature. I address these claims below, and show that they are inconsistent with the literature.

2.4.1. The model I use has been used in the academic literature and accepted by Courts

29. First, Dr. Steward suggests that analyzing differences in crime across neighborhoods with different racial breakdowns is somehow non-standard or not accepted.³⁹ This claim is simply untrue.

30. A leading example of this methodology can be seen in a set of papers by Prof. Jeffrey Fagan of Columbia University and his co-authors that analyze whether New York City's "Stop, Question, and Frisk" program ("SQF") was used more heavily in minority neighborhoods.⁴⁰ In two different papers, Prof. Fagan and his co-authors build a statistical model of the frequency and location of the SQF program that has the same general methodological structure as my model of the frequency and location of roadblocks. Specifically, they include counts of SQF encounters at the precinct level as their dependent variable (just as the dependent variable in my model is counts of roadblocks at the census tract level). They then include controls for the direct measures of crime that SQF seeks to regulate (just as I include controls for the frequency of DUI and traffic violations variables). Further, they also include controls for certain characteristics of neighborhood *residents* (just as I do). Finally their main variable of interest is a variable measuring the share of Black residents in a given precinct and, just as in my model, they examine whether the coefficient on the share of Black residents is statistically significant, after controlling for crime in the neighborhood.⁴¹ In

³⁹ Steward Report, ¶ 47.

⁴⁰ Fagan, Jeffrey. et al., "Street Stops and Broken Windows Revisited: The Demography and Logic of Proactive Policing in a Safe and Changing City," Stephen K. Rice, and Michael D. White, (Eds.), *Race, Ethnicity, and Policing: New and Essential Readings*, New York University Press, New York and London, 2009, pp. 309–348; Gelman, Andrew et al., "An Analysis of the New York City Police Department's 'Stop-and-Frisk' Policy in the Context of Claims of Racial Bias," *Journal of American Statistical Association*, 109(479), pp. 813–823. One of Fagan's co-authors in this work is Andrew Gelman, one of the preeminent statisticians in the field, who has received the Outstanding Statistical Application award from the American Statistical Association (the award for best article published in the *American Political Science Review*) and the Council of Presidents of Statistical Societies award for outstanding contributions by a person under the age of 40.

⁴¹ It is worth noting that rather than normalizing their variables by population and using an OLS regression, Prof. Fagan and his colleagues include population as a control variable and use a Poisson regression. These two approaches are

addition to being published in academic journals, Prof. Fagan's model was relied on by Courts in *Floyd et al. v. the City of New York*, including specifically his analysis of how SQF varied with the share of residents who were Black.⁴²

31. This same methodological approach has been used in published academic papers to examine how a variety of different economic outcomes differ between neighborhoods with different racial compositions, while controlling for relevant non-race factors that affect the outcomes of interest. For example, empirical research on the possibility of "redlining" (i.e., banks offering different terms on mortgages in Black neighborhoods, even after controlling for non-race factors) uses the same statistical model to assess how lending in different neighborhoods vary with the population of the neighborhood that is Black, controlling for other factors.⁴³ There is also a literature that examines how the racial composition of different neighborhoods affects schooling and employment outcomes, including papers by top economists like David Card, Ed Glaeser, Raj Chetty, and Larry Katz in top peer-reviewed journals.⁴⁴ These papers also use the same general statistical approach of comparing outcomes across geographic areas with different racial compositions.

closely related, as they both control for population – they simply use a slightly different approach. As shown in Exhibit 4, I have run my model using a Poisson regression as Prof. Fagan does, and it yields the same conclusion as my model.

⁴² Opinion and Order, *Floyd et al. v. the City of New York*, 5/16/2012, pp. 6–7.

⁴³ Rougeau, Vincent D. and Keith N. Hylton, "Lending Discrimination: Economic Theory, Econometric Evidence, and the Community Reinvestment Act," *The Georgetown Law Journal*, 85(237), 1996, pp. 237–292, 269–270 ("The studies we will examine use regression analysis to test for discrimination in lending. This is the most powerful method of testing for discrimination in a sample of lending decisions, because it allows the researcher to isolate the influence of each factor on the decision to lend. A typical regression model might specify the total dollar amount of residential loans in a geographic market as a linear function of several variables, such as the average income of residents and the percentage of minority residents. Thus, if L = total loans in neighborhood j ($j = 1, \dots, N$, where N is the number of neighborhoods), I = average income in neighborhood j , and R = percentage of minority residents in neighborhood j , a regression model would specify $L = b_1I + b_2R + e$, where b_1 and b_2 are coefficients and e is a random error. If the coefficient on R , b_2 , is negative and statistically significant, then the data indicate that if one holds fixed the level of average neighborhood income, neighborhoods with high minority percentages receive less credit. If one believes that average neighborhood income should account for differences in the level of total lending to communities, with the combination of other influences having an essentially random influence, then this would be taken as evidence of discrimination.").

⁴⁴ See for example, Card, David and Jesse Rothstein, "Racial Segregation and the Black-White Test Score Gap," *Journal of Public Economics*, 91(11–12), 2007, pp. 2158–2184; Cutler, David M. and Edward L. Glaeser, "Are Ghettos Good or Bad?" *Quarterly Journal of Economics*, 112(3), 1997, pp. 827–872; and Chetty, Raj, Nathaniel Hendren, and Lawrence F. Katz, "The Effects of Exposure to Better Neighborhoods on Children: New Evidence from the Moving to Opportunity Experiment," *American Economic Review*, 106(4), 2016, pp. 855–902. All three papers use census tracts.

32. More generally, as I explained in my first report, the type of multiple regression analysis I use in my analysis that attempts to isolate the effect of race separately from non-race factors is a widely accepted and common statistical technique in both academia and litigation for assessing the possibility of discrimination in a variety of settings (e.g., hiring, wages, and mortgage lending).⁴⁵ Courts have relied on multiple regression analysis in a variety of discrimination matters. For example, the Federal Judicial Center's *Reference Manual for Scientific Evidence* (a document designed to aid federal judges in assessing scientific evidence) dedicates an entire chapter to multiple regression analysis, including applications to questions of discrimination.⁴⁶ Regression analysis is a useful tool to assess claims of discrimination precisely because it allows a researcher to control for relevant factors in the available data that affect the outcome of interest (e.g., the behavior of motorists) in order to more reliably isolate the effect of the variable on which there is alleged discrimination (e.g., race, gender, age).

33. In sum, the type of regression analysis I use in my report has (a) been used in academic papers to directly test whether policing differs with the residential population of different neighborhoods (after controlling for crime), (b) been used in a wide variety of academic papers analyzing questions of race and other economic outcomes, and (c) been relied on by Courts in cases involving claims of discrimination in a variety of contexts.

2.4.2. Use of census tract data, and other geographic data, is standard in the academic literature

⁴⁵ Rubinfeld, Daniel L., "Reference Guide on Multiple Regression," *Reference Manual on Scientific Evidence*, 3rd Edition, Federal Judicial Center, the National Academies Press, Washington, D.C., 2011, pp. 312–317; Altonji, Joseph G., and Rebecca M. Blank, "Race and Gender in the Labor Market," Ashenfelter, Orley David C., Card, (Eds.), *Handbook of Labor Economics*, 3, 1999; Blau, Francine D., and Lawrence M. Kahn, "Gender Differences in Pay," *Journal of Economic Perspectives*, 14(4), 2000, pp. 75–99; Rougeau, Vincent D. and Keith N. Hylton, "Lending Discrimination: Economic Theory, Econometric Evidence, and the Community Reinvestment Act," *The Georgetown Law Journal*, 85(237), 1996, pp. 237–294, 269-270.

⁴⁶ Rubinfeld, Daniel L., "Reference Guide on Multiple Regression," *Reference Manual on Scientific Evidence*, 3rd Edition, Federal Judicial Center, the National Academies Press, Washington, D.C., 2011, pp. 305–307 ("Regression analysis has been used most frequently in cases of sex and race discrimination, antitrust violations, and cases involving class certification.").

34. In addition to arguing that my use of racial breakdown of residents at the census tract-level is not accepted methodology, Dr. Steward also claims that the fact that my analysis is conducted at the census tract level is problematic. One reason for this critique is that the racial distribution *within a census* tract can vary.⁴⁷ This critique by Dr. Steward is at odds with the large literature in economics that routinely analyzes data across different geographic units to measure the correlations of key variables. This type of analysis is a widely accepted methodology for understanding why different neighborhoods, cities, states, and/or regions have different outcomes and experiences. As one widely used textbook notes, “Often the data used in empirical economics are at the city or county level.”⁴⁸

35. This literature includes numerous analyses of crime and policing across geographic areas. For example, as already discussed above, Prof. Fagan’s work has this feature. More generally, there is a large body of academic research that uses differences in crime activity and policing activity across different geographical units (cities, counties, etc.) to understand the relationships between crime, policing and other variables.⁴⁹ In fact, I understand Dr. Steward himself has conducted analysis across much larger geographic regions in prior expert work on crime and race.⁵⁰

36. The use of census tracts in particular is also accepted in the literature. A variety of published papers in top journals leverage census tract data to analyze how different economic outcomes vary across neighborhoods based on the racial composition of those neighborhoods, and other socioeconomic factors.⁵¹ This research includes several papers analyzing an intervention called the MTO (Moving to Opportunity) program conducted by the U.S. Department of Housing and Urban Development, which moved a set of children from relatively high

⁴⁷ Steward Report, ¶¶ 43–46.

⁴⁸ Wooldridge, Jeffrey M., *Introductory Econometrics: A Modern Approach*, 5th Edition, South-Western Cengage Learning, Mason, Ohio, 2012, p. 689.

⁴⁹ Chalfin, Aaron, and Justin McCrary, “Criminal Deterrence: A Review of the Literature,” *Journal of Economic Literature*, 55(1), 2017, pp 5–48, offers a summary of the literature. See also the Rebuttal Expert Report of Justin McCrary, Ph.D., July 2, 2018 (“McCrary Report”)

⁵⁰ Opposition to Defendants’ Joint Motion to Exclude Dwight Steward, Ph.D., as an Expert Witness, *Kelly v. Paschall*, February 24, 2005.

⁵¹ See for example, Card, David and Jesse Rothstein, “Racial Segregation and the Black-White Test Score Gap,” *Journal of Public Economics*, 91(11–12), 2007, pp. 2158–2184; Cutler, David M. and Edward L. Glaeser, “Are Ghettos Good or Bad?” *Quarterly Journal of Economics*, 112(3), 1997, pp. 827–872; and Chetty, Raj, Nathaniel Hendren, and Lawrence F. Katz, “The Effects of Exposure to Better Neighborhoods on Children: New Evidence from the Moving to Opportunity Experiment,” *American Economic Review*, 106(4), 2016, pp. 855–902.

poverty neighborhoods to relatively low poverty neighborhoods, and then tracked their successes over time relative to a control group that did not move. This study identified high poverty neighborhoods with census tracts.

37. All of the papers discussed above have the same feature in their data that Dr. Steward criticizes in my analysis. They include variables that are measured across geographic units, such as census tract, county, city-level, etc., and those variables have values that vary across sub-areas of whatever geographic unit is being analyzed. Yet all of these papers are published in peer-reviewed journals. It is well understood in the academic literature that this type of data introduces a type of white noise, which is commonly referred to as measurement error. This feature of the data is understood to, if anything, make it *more difficult* to find a statistically significant correlation, as the additional noise tends to attenuate the estimated statistical relationship between difference variables. In Section 3 below, I discuss this issue in more detail.

38. Dr. Steward's claim that this issue makes my analysis unreliable is, thus, inconsistent with basic econometric principles and inconsistent with accepted practice in the scientific literature.

2.5. Dr. Steward overstates the role of factors not included in my model

39. Dr. Steward also argues that unobserved factors not included in my model could explain the estimated effect that the model currently attributes to the racial composition of the census tract. Dr. Steward alleges that I did not consider standard approaches to test the potential effects of omitted factors.⁵² There are a few points worth noting here.

40. As discussed in my first report, it is widely recognized that R-Squared is a statistic that helps measure how well the control variables in the regression model explain the frequency of roadblocks across the different census tracts.⁵³ The R-

⁵² Steward Report, ¶¶ 74–75.

⁵³ Rubinfield, Daniel L., "Reference Guide on Multiple Regression," *Reference Manual on Scientific Evidence*, 3rd Edition, Federal Judicial Center, the National Academies Press, Washington, D.C., 2011, p. 316 ("In general, the more complete the explained relationship between the included explanatory variables and the dependent variable, the more precise the results.").

Squared of 0.65 in my model is considered to be a large R-Squared. For example, as I noted in my first report, one popular econometrics textbook states that, “in terms of the values one normally encounters in cross sections, an R-Squared of 0.5 is relatively high.”⁵⁴

41. Further, a widely accepted practice for testing whether the results of a regression may be sensitive to the addition of omitted variables is to run different sensitivity analyses and assess the overall pattern of the coefficient as more variables are added, and as other changes are made to the model.⁵⁵ As detailed in Appendix C Exhibits 1-6 and in my workpapers, I have now run more than 50 sensitivities of my model. Across all such sensitivities, the coefficients are statistically significant and stable. Further, the addition of more variables does not decrease the effect of race.

42. Note that the sensitivity results are unsurprising because we already control for what Dr. Steward agrees is the most important determinant of roadblocks. Adding other factors to the regression should not be expected to change the results once the key factor is considered, and the data bears this out. Indeed, Dr. Steward’s own sensitivity analysis in which he adds control variables for bars and restaurants supports this conclusion. As shown above, that model finds that the effect is, if anything, a bit larger in magnitude than my original model.

2.6. Dr. Steward misrepresents my descriptive analysis, and incorrectly claims that I do not perform tests of statistical significance

43. Dr. Steward also criticizes the summary of data that I present in Section 4.1 of my report. Dr. Steward identifies two issues with that analysis, each of which I discuss below. In making these criticisms, Dr. Steward demonstrates a basic misunderstanding of the purpose of summary data.

⁵⁴ Greene, William H., *Econometric Analysis*, 6th Edition, Pearson Prentice Hall, Upper Saddle River, New Jersey, 2008, p. 38.

⁵⁵ Oster, Emily, “Unobservable Selection and Coefficient Stability: Theory and Evolution” NBER Working Paper, August 9, 2016, p. 2 (“A common approach in these situations [wherein observed controls are an incomplete proxy for the true omitted variable or variables] is to explore the sensitivity of treatment effects to the inclusion of observed controls. If a coefficient is stable after inclusion of the observed controls, this is taken as a sign that omitted variable bias is limited.”).

44. Beginning a statistical analysis with a descriptive overview of the patterns in key variables is standard in academic papers. Indeed, basic statistics and econometrics textbooks note that it is common to start an analysis with a descriptive summary of key variables before developing a formal statistical test.⁵⁶ The fact that Dr. Steward focuses much of his criticism on basic descriptive statistics rather than on the formal statistical tests in my regression model is atypical in academic research, as the regression model is the formal statistical method for testing the hypothesis while controlling for other factors.⁵⁷

45. One of Dr. Steward's criticisms is that I did not present a test of statistical significance in that section.⁵⁸ This statement suggests that Dr. Steward misunderstands the purpose of the data summary. As I explicitly stated in my initial report, the purpose of the data summary was not to perform a statistical test, but rather to highlight the general patterns in the data. As Dr. Steward himself discusses in his report, it is necessary to control for other factors which can influence roadblock placement prior to testing whether any effect can be attributed to race.⁵⁹ As is appropriate and consistent with this standard methodology, I do in fact perform a test of statistical significance in the context of my regression model that controls for driving behavior and other factors. The summary of the data presented in Section 4.1 is meant only to highlight general patterns in the data that inform my regression analysis. In fact, I discussed this issue clearly in my initial report.

“I start my analysis in Section 4.1 with a set of descriptive analyses that highlight the general patterns in the location and frequency of

⁵⁶ Moore, D., and McCabe, G., *Introduction to the Practice of Statistics*, 5th Edition, W.H. Freeman and Company, New York, 2004, at p. 7 (“Statistical tools and ideas help us examine data in order to describe their main features. This examination is called exploratory data analysis. Like an explorer crossing unknown lands, we want first to simply describe what we see.”); See also Kennedy, Peter, *A Guide to Econometrics*, 6th Edition, Blackwell Publishing, 2008, p. 364; Wooldridge, Jeffrey M., *Introductory Econometrics: A Modern Approach*, 5th Edition, South-Western Cengage Learning, Mason, Ohio, 2012, p. 690.

⁵⁷ Wooldridge, Jeffrey M., *Introductory Econometrics: A Modern Approach*, 5th Edition, South-Western Cengage Learning, Mason, Ohio, 2012, p. 68 (“Multiple regression analysis...allows us to *explicitly* control for many other factors that simultaneously affect the dependent variable. This is important both for testing economic theories and for evaluating policy effects when we must rely on nonexperimental data. The multiple regression model is still the most widely used vehicle for empirical analysis in economics and other social sciences”).

⁵⁸ Steward Report, ¶ 64.

⁵⁹ Steward Report, ¶ 48.

roadblocks across the 21 different census tracts in Madison County. I show that the frequency of roadblocks is generally higher in census tracts with a substantially higher percentage of Black residents. In Section 4.2, I then present the findings of my regression analysis, where I formally test whether the frequency of roadblocks is higher in census tracts with a higher percentage of Black residents, controlling for other factors that are predictive of differences in traffic behavior.”⁶⁰

46. Dr. Steward also argues that my grouping of the census tracts into two groups (those with a relatively high share of Black residents and those with a relatively low share) somehow makes my analysis unreliable. In fact, Dr. Steward asserts that I assume “racial bias appears when a census tract achieves an African-American population of 46.2%.”⁶¹ This argument is incorrect and again misrepresents how my analysis works. While it is true that I group the census tracts into two groups when summarizing the data to highlight the fact that there is large variation in the racial population across the county, in the formal statistical tests that I run using my regression model in Section 4.2, I *do not* group the census tracts in this manner. Thus, none of my conclusions depend in *any way* on the grouping of census tracts that I present as a descriptive device. Further, Dr. Steward’s various re-groupings of my descriptive analysis do not in any way rebut (or even address) the findings from my regression analysis, which are the appropriate and rigorous way to test for a general relationship between roadblocks and the racial breakdown across census tracts (controlling for other factors).

3. DR. STEWARD’S ANALYSIS OF THE GEOCODING DATA IGNORES BASIC ECONOMETRIC PRINCIPLES

47. In addition to commenting on my statistical methodology, Dr. Steward (as well as Mr. Funderburk) also makes several claims about the data I use on the location of roadblocks. They point in particular to three facts about the location data produced by MCSD. First, they note that it is common for MCSD to report roadblocks based on intersections rather than exact addresses.⁶² Second, they note

⁶⁰ Ricchetti Report, ¶¶ 35–36.

⁶¹ Steward Report, ¶ 35.

⁶² Steward Report, ¶ 26; Funderburk Report, ¶¶ 22, 44.

that a set of roadblocks were established on the boundaries of census tracts.⁶³ Third, they note that some of the specific address information produced by MCSD does not line up with physical locations where a roadblock could reasonably occur.⁶⁴

48. In this section, I explain how Dr. Steward's and Mr. Funderburk's critiques of the roadblock data ignore the relevant question from a statistical point of view: do these potential data issues have any meaningful effect on the key findings from my regression analysis? As I explain below, using basic econometric principles of measurement error that I discussed above, there are well-accepted methods for testing this question. Despite these well-accepted methods, neither Dr. Steward nor Mr. Funderburk offer *any tests* to show that the existence of roadblocks on census boundaries affect my conclusions. As I show, when I run such tests I find that my findings are not sensitive to the data issues they describe. Specifically, as I show below, even if we employ a standard technique of removing data points with potential measurement issues, the general findings of my regression model remain unchanged and the precision of my model actually increases – a result that is consistent with the large academic literature on measurement error. In fact, even if I make the assumption that every roadblock on the boundary was in fact set up in the census tract it borders with a relatively *lower share* of Black residents, my regression still finds that roadblock frequency increases in census tracts with a higher share of Black residents.

49. While Mr. Funderburk and Dr. Steward both suggest that this measurement challenge renders my analysis unreliable, it is striking that neither of them offer any statistical test that demonstrates that this measurement challenge affects my results in any meaningful way. As I explain below, making such an argument without running a statistical test for whether it matters is not consistent with standard methods described in econometrics textbooks.⁶⁵ Following standard

⁶³ See for example, Steward Report, ¶¶ 30–31, 41; Funderburk Report, ¶ 48.

⁶⁴ See for example, Steward Report, ¶¶ 28–29; Funderburk Report, ¶ 48.

⁶⁵ Wooldridge, Jeffrey M., *Introductory Econometrics: A Modern Approach*, 5th Edition, South-Western Cengage Learning, Mason, Ohio, 2012, pp. 684–685. (“If your model has some potential misspecification, such as omitted variables, and you use OLS, you should attempt some sort of misspecification analysis of the kinds we discussed in Chapters 3 and 5. Can you determine, based on reasonable assumptions, the direction of any bias in the estimators.... Good papers in the empirical social sciences contain sensitivity analysis. Broadly, this means you estimate your original model and modify it in ways that seem reasonable. Hopefully, the important conclusions do not change.”).

methodological practice, I have tested whether the presence of measurement error biases my conclusions in any way. It does not.

50. Finally, as explained in Dr. Frontiera's report, the geocoding approach used in my first report is a standard approach and consistent with best practices. Additionally, the criticisms of Mr. Funderburk are derived from a non-random sample and caused by poor data quality in the data produced by MCSD, rather than geocoding methods.⁶⁶

3.1. Measurement error is a well-recognized feature of many regression models, and is only a problem if the error is correlated with the variable of interest

51. The main thrust of Mr. Funderburk and Dr. Steward's concern about roadblock data is that some of the roadblocks are near the boundary between two census tracts and may be incorrectly assigned to the wrong census tract based on the information provided in MCSD database.⁶⁷ This concern amounts to a very standard methodological issue that is widely studied in econometrics – measurement error.⁶⁸

52. As is well understood in the scientific literature (and discussed in introductory econometrics textbooks), the key question in such a situation is: how does the presence of such noise in the data affect the regression coefficients? This question is one of the most standard methodological questions in econometrics because it is common for data used in social science to be imprecisely measured.

53. For example, one academic paper on empirical methods in econometric analysis, written by Alan Krueger, former Chair of the Counsel of Economic Advisors to the President, and Josh Angrist (MIT) notes that: “[I]t is probably

⁶⁶ Rebuttal Expert Report of Patricia Frontiera, Ph.D., July 2, 2018 (“Frontiera Report”), ¶¶ 9, 61.

⁶⁷ Steward Report, ¶¶ 31, 41; Funderburk Report, ¶¶ 16, 51.

⁶⁸ It is worth noting that, in his deposition testimony, Dr. Steward did not accurately define measurement error. Dwight Steward Deposition, pp. 186:17–187:7. (“Q. And what is your understanding of that term [measurement error]? A. Measurement error is not data error. Measurement error is a completely statistical term. And again, it has to do with a tool, not with the data. Measurement error just has to do with accounting for the fact that there are going to be some things you can't measure. Like, the classic example is fire in the belly when you're looking at salary. You're going to have some people that just work really hard and other people that don't really hard. But on average, when you're doing a salary analysis, it balances out.”)

best to think of data as routinely being mismeasured. Although few economists consider measurement error the most exciting research topic in economics, it can be of much greater practical significance than several hot issues.”⁶⁹ In fact, the *Reference Manual on Scientific Evidence* – a treatise designed to address methodological issues that arise in expert testimony – also discusses the issue of measurement error, and how to test whether it affects a model’s results.⁷⁰

54. Mathematically, measurement error is expressed as follows:

$$\text{Measured Roadblocks}_i = \text{Roadblocks}_i + u_i$$

55. The key parameter in the above equation is u_i , which is referred to as measurement error in the econometrics literature. As explained in econometrics textbooks, in order to understand whether the presence of u_i presents any problems for a regression analysis like mine, the key question is whether u_i is correlated in a very specific way with the race variable in my model. For example, it could be that the existence of u_i causes my model to *understate* the number of roadblocks in census tracts with a high share of Black residents. If that were the case, my model would be conservative. On the other hand, it could be that the existence of u_i causes my model to *overstate* the number of roadblocks in census tracts with a high share of Black residents, which would make my model overstate the correlation between race and roadblocks. There are several key insights in the scientific literature about measurement error that help explain why it does not typically pose a problem for regression analysis.

56. First, when measurement error is generated by data entry issues (i.e., the person entering the data into the database does not enter complete information), typically the measurement error represents nothing more than random noise. In this situation, measurement error ***does not lead to any bias in the regression analysis***. The only effect is to decrease the precision of the regression coefficients, making it *harder* to find a significant effect. For example, a widely used textbook in econometrics describes these issues in the following passage:

⁶⁹ Angrist, Joshua D., and Alan B. Krueger, "Empirical Strategies in Labor Economics," Orley C. Ashenfelter and David Card, (Eds.), *Handbook of Labor Economics*, 1999, p. 1340–1341.

⁷⁰ Rubinfeld, Daniel L., "Reference Guide on Multiple Regression," *Reference Manual on Scientific Evidence*, 3rd Edition, Federal Judicial Center, the National Academies Press, Washington, D.C., 2011, pp. 327–328.

“The usual assumption is that the measurement error in [a dependent variable] is statistically independent of each explanatory variable. ***If this is true, then the OLS estimators [the regression coefficients] are unbiased and consistent.*** Further, the usual OLS inference procedures (*t*, *F*, *LM* statistics are valid)... measurement error in the dependent variable results in a larger variance than when no error occurs; this, of course, results in larger variances of the OLS estimators.... The bottom line is that, ***if the measurement error is uncorrelated with the independent variables, then OLS estimation has good properties.***”⁷¹ (emphasis added)

57. Krueger and Angrist describe the issue as follows:

“What are the implications of classical measurement error?... If Y_i [the dependent variable] is regressed on one or more correctly-measured explanatory variables, the expected value of the coefficient estimates is not affected by the presence of the measurement error. ***Classical measurement error in the dependent variable leads to less precise estimates - because the errors will inflate the standard error of the regression - but does not bias the coefficient estimates.***”⁷² (emphasis added)

58. Further, when measurement error is present in an independent variable (as Dr. Steward claims of my race variable), ***the main effect of measurement error is attenuate, or shrink, the size of the coefficient of interest.*** For example, the *Reference Manual on Scientific Evidence* notes the following:

“[I]f one or more independent variables are measured with error, the corresponding parameter estimates are likely to be biased, typically toward zero (and other coefficient estimates are likely to be biased as well). To understand why, suppose that the dependent variable, salary, is measured without error, and the explanatory variable, experience, is

⁷¹ Wooldridge, Jeffery M., *Introductory Econometrics: A Modern Approach*, 5th Edition, South-Western Cengage Learning, Mason, Ohio, 2012, pp. 318–319.

⁷² Angrist, Joshua D., and Alan B. Krueger, “Empirical Strategies in Labor Economics,” Orley C. Ashenfelter and David Card (Eds.), *Handbook of Labor Economics*, 1999. p. 1340

subject to measurement error. (Seniority or years of experience should be accurate, but the type of experience is subject to error, because applicants may overstate previous job responsibilities.) As the measurement error increases, the estimated parameter associated with the experience variable will tend toward zero, that is, eventually, there will be no relationship between salary and experience.”⁷³

59. In other words, the typical effect of the measurement error that Dr. Steward and Mr. Funderburk describe in my analysis is to increase the standard errors of the regression coefficients, making it harder for my analysis to find statistical significance, and, thus, if anything, **shrink** the effect of race, making my analysis more conservative. As I show in the next sub-section, a variety of sensitivity analyses confirm that any imprecision in the measurement of roadblocks per census tract have no effect on my ultimate conclusions.

60. Before moving on to my sensitivity analysis, it is worth noting one other data issue that Mr. Funderburk and Dr. Steward raise. Both point out that many of the roadblocks *not* on the boundary of the census blocks are located at intersections rather than exact addresses.⁷⁴ As Dr. Frontiera explains, this data feature is common in geocoding and does not present a problem.⁷⁵ As I discuss below, to demonstrate that such concerns are not a problem for my analysis I have also hand-entered each roadblock and tested whether my findings change. They do not.

3.2. When I apply standard sensitivity tests for roadblocks that are near the boundary of census tracts, my findings are unchanged

61. In response to the criticisms of Mr. Funderburk and Dr. Steward, I perform several analyses, which can quantify the implications of their criticisms on my model (notably, Dr. Steward and Mr. Funderburk attempt no such calculations on their own).

⁷³ Rubinfield, Daniel L., “Reference Guide on Multiple Regression,” *Reference Manual on Scientific Evidence*, 3rd Edition, Federal Judicial Center, the National Academies Press, Washington, D.C., 2011, pp. 327; See also Angrist, Joshua D., and Alan B. Krueger, “Empirical Strategies in Labor Economics,” Orley C. Ashenfelter and David Card (Eds.), *Handbook of Labor Economics*, 1999. p. 1340.

⁷⁴ Steward Report, ¶ 26.; Funderburk Report, ¶¶ 22, 44.

⁷⁵ Frontiera Report, ¶¶ 29-31.

62. A standard and well-accepted way to test whether measurement error affects the results of a regression model is to run sensitivity tests of the main model by removing the data points that are likely to have measurement error. For example, the *Reference Manual on Scientific Evidence* notes the following:

“In general, it is important to explore the reasons for unusual data points. If the source is an error in recording data, the appropriate corrections can be made. If all the unusual data points have certain characteristics in common (e.g., they all are associated with a supervisor who consistently gives high ratings in an equal pay case), the regression model should be modified appropriately. One generally useful diagnostic technique is to determine to what extent the estimated parameter changes as each data point in the regression analysis is dropped from the sample.”⁷⁶

63. The literature also refers to this technique as “trimming.”⁷⁷ One common example of trimming that has been used in the academic literature occurs when economists analyze self-reported income. It is well-known that some subset of people will significantly over-report and/or under-report their income for a variety of reasons. In order to ensure that this type of measurement error does not affect statistical analyses of wages, academics often times remove the highest and lowest wage values from their data because these data points are the ones most likely to have measurement error.⁷⁸ Papers have also applied trimming techniques to potential measurement error in geographic boundaries.⁷⁹

⁷⁶ Rubinfield, Daniel L., “Reference Guide on Multiple Regression,” *Reference Manual on Scientific Evidence*, 3rd Edition, Federal Judicial Center, the National Academies Press, Washington, D.C., 2011, pp. 327.

⁷⁷ Angrist, Joshua D., and Alan B. Krueger, “Empirical Strategies in Labor Economics,” *Handbook of Labor Economics*, 1999. Orley C. Ashenfelter and David Card (Eds.), p. 1347 (“Researchers have employed a variety of ‘trimming’ techniques to try to minimize the effects of observations that may have been misreported.”).

⁷⁸ Angrist, Joshua D., and Alan B. Krueger, “Empirical Strategies in Labor Economics,” Orley C. Ashenfelter and David Card, (Eds.), *Handbook of Labor Economics*, 1999, pp. 1347–1349.

⁷⁹ For example, in a paper that analyzed the economics of health care privatization, the authors analyzed the effectiveness of Medicare Advantage relative to fee-for-service policies for patients who used hospitals in NY State. The data they analyzed could not account for the fact that some patients that lived in NY State might cross the border to use hospitals in other states. To test that their findings were not sensitive to this issue, they ran their model removing beneficiaries that lived near the state boundary. See Duggan, Mark, Jonathan Gruber, and Boris Vabson, “The Consequences of Health Care Privatization: Evidence from Medicare Advantage Exits,” *American Economic Journal: Economic Policy*, 10(1), 2018, p. 169. (“A final concern is that our inpatient data is limited to New York State only, and fails to track visits to hospitals in surrounding states. This could result in biased estimates, in the event that MA enrollees in New York have

64. An even stronger way to test whether the existence of roadblocks on the boundary drives my findings is to assume that every roadblock on the boundary was assigned to the census tract that it borders that has the lowest share of Black residents. In other words, it is possible to see if the statistically significant relationship between roadblock frequency and the share of the population that is Black holds even if every roadblock on the boundary was in fact in a census tract with the highest white share. This directly tests the concerns of Dr. Steward and Mr. Funderburk that roadblocks that are in census tracts with a relatively high share of Black residents are being placed there in error.

65. To conduct these sensitivities, my team hand-coded every roadblock and DUI in the CAD data under my supervision. That is, using Google Maps, my team reviewed every individual address or intersection and identified to which census tract these incidents belong. I further identified cases where such incidents could ostensibly be on the border between multiple census tracts. These steps both allow for a direct test of whether any measurement error in my original analysis drove my results.

66. Exhibits 5 and 6 present results from these sensitivity analyses. A clear pattern emerges – my main findings hold in all analyses. The sensitivities are as follows:

- In Exhibit 5, I remove from my analysis the roadblocks that, based on the GIS coding in my original report, are within 20 meters of a census tract border. As is clear, the coefficient on share of population that is Black remains statistically significant. I also perform sensitivities to this model to show that Dr. Steward's other criticisms of my original model related to simultaneity bias, normalizing variables by population, and including allegedly irrelevant control variables do not affect my findings. In all cases, my results are unchanged.⁸⁰
- In Exhibit 6, I keep all of the roadblocks that, by manual inspection, appear to be on the boundary between two census tracts, and assign

differential rates of out-of-state inpatient usage, relative to those in FFS. We perform two different robustness checks, which involve the exclusion of populations more likely to use out-of-state hospitals. In one test, we exclude beneficiaries who live in exit counties and simultaneously reside within ten miles of a state border. In another test, we take a more systematic approach to identifying potential out-of-state hospital users by leveraging hospital service area (HSA) definitions; we exclude those living in exit counties AND simultaneously living in a zip code that is in a non-NY HSA.”)

⁸⁰ See workpaper.

them to the census tract that they border **that has the lowest share of Black residents**. As is clear, even when I make this assumption, my results hold. I again perform sensitivities to show that Dr. Steward's other criticisms my original model related to simultaneity bias, normalizing variables by population, and including allegedly irrelevant control variables do not affect my findings. In all cases, my results are unchanged.⁸¹

67. The fact that my model finds statistically significant and positive coefficients on the share of residents who are Black *across all sensitivities* demonstrates that my findings are unaffected by any imprecisions in the data due to roadblocks being on the boundary. In other words, the higher frequency of roadblocks in census tracts with a higher share of Black residents exists regardless of how the boundary roadblocks are treated.

4. CONCLUSION

68. Dr. Steward identifies a variety of critiques of my statistical model in his report, but my methodology is widely used in academic papers and by the Courts in litigation. In fact, Dr. Steward has used the same broad methodology (for example, making comparisons across geographic regions) in his own work.

69. Further, using sensitivity analyses, I have shown that the various claims Dr. Steward makes about the control variables in my model and the data have no consequence on the findings of my model. Consistent with standard methodology, I have run a wide variety of sensitivity analyses and robustness checks to my model (I have run over 50 different specifications of my model), and *all* of them support the same conclusion. The fact Dr. Steward has levied numerous criticisms of my model without even testing whether they affect the main findings of my model is inconsistent with professional standards.



Bryan Ricchetti, Ph.D.

⁸¹ See workpaper.

BRYAN RICCHETTI, Ph.D.**Vice President****Cornerstone Research**181 West Madison Street, 43rd Floor • Chicago, IL 60602-4558

312.345.7320 • fax 312.345.7399

bricchetti@cornerstone.com**ACADEMIC BACKGROUND**9/02 – 7/07 **Cornell University** Ithaca, New York*Ph.D., Economics, Applied Econometrics, Labor Economics*9/95 – 5/99 **Hamilton College** Clinton, New York*B.A., Economics with Honors, Magna Cum Laude, Phi Beta Kappa***PROFESSIONAL EXPERIENCE**9/07 – Present **Cornerstone Research, Inc.** Chicago, Illinois*Vice President*

- Manage and conduct economic analysis for complex business litigation and regulatory matters, with specialization in antitrust, labor, class action, market manipulation and product misrepresentation matters.
- Expertise applying a wide range of empirical and theoretical methods to complicated market settings, including the application of statistical methods to analysis of large, proprietary data sets.
- Industry focus includes: retail, food and agriculture, the economics of distribution, and sports economics.

Selected Consulting Experience

- *Wage Discrimination Matter* Analyzed claims of gender discrimination. Oversaw the statistical analysis of wage and promotion patterns in internal personnel records for one of the largest employers in the world.
- *Monopsony Wage Fixing Cartel in Sports Industry* Analyzed claims that wages were capped by a sports regulatory organization. Oversaw statistical analysis of key issues.
- *Monopsony Wage Fixing Cartel in Service Industry* Analyzed claims of monopsony wage suppression in service industry. Managed and implemented statistical analysis of complex payroll records. Conducted liability and damages analysis.

BRYAN RICCHETTI, Ph.D.

Vice President, Cornerstone Research

- *Wage Discrimination Consulting Matters* Analyzed wage and promotion patterns in internal personnel records for large private company. Implemented econometric tests.
- *Wrongful Termination Gender Discrimination Matter* Analyzed wage and job history data to assess damage claims for employees who were allegedly wrongfully terminated by employer.
- *Alleged Cartels in Dairy Industry* (*Alice H. Allen et al. v. Dairy Farmers of America, Inc., et al. and Sweetwater Valley Farm, Inc., et al., v. Dean Foods Company, et al.*) Analyzed liability, damages, and class certification issues in multiple cases alleging vertical and horizontal conspiracies, price-fixing and quantity restrictions in the dairy industry. Analyzed pricing data at all levels of the industry, including issues of pass-through. Oversaw implementation of econometric analysis.
- *Alleged Monopoly and Foreclosure in Home Recreation Industry* Assessed claims of attempted monopoly and foreclosure by large distributor of home recreation products. Developed statistical model of damages to measure alleged impact of challenged conduct.
- *Merger in Food and Agriculture Industry* Analyzed potential economic impacts of a proposed merger between two large distributors. Assessed industry structure, competitive landscape, and possible price effects.
- *Regulatory matters involving state-level alcohol laws* Analyzed the economic impact of changes to state-level laws related to the distribution of beer, wine, and liquor in one state, and retail sale of liquor in another state. Assessed the potential effect of law change on alcohol consumption, tax revenue, and relevant social and economic outcomes.
- *LIBOR Manipulation Matters* Conceptualized and managed econometric analysis to understand the effect of the alleged conduct on rate trends. Prepared findings for regulatory investigation.

9/03 – 9/07 **US Census Bureau, LEHD**

Ithaca, New York

Labor Economist

- Conducted econometric analysis related to research program on data confidentiality. Performed complex statistical modeling of key labor market outcomes. Authored internal papers and presentations.

7/99 – 7/2002 **MDRC**

New York, New York

Research Assistant

- Conducted economic and statistical analyses of the effect of welfare-to-work programs on labor market outcomes.

BRYAN RICCHETTI, Ph.D.

Vice President, Cornerstone Research

TESTIMONY

Wal-Mart Puerto Rico, Inc. v. Juan C. Zaragoza-Gomez U.S. District Court, District of Puerto Rico. Retained by counsel for Plaintiff. Analyzed statistics issue. Filed affidavit on 1/19/16, deposed, and testified at trial.

Dunmars v. Board of Trustees of Community College District No. 510 and Jorie Menclewicz U.S. District Court, Northern District of Illinois, Eastern Division. Retained by counsel for Plaintiff. Damages analysis in lost wages matter. Report filed on 3/18/16.

Scott Swanson v. Epic Systems Corporation U.S. District Court, Western District of Wisconsin. Retained by counsel for Defendant. Rebuttal of Plaintiff expert regression analysis in age discrimination matter. Report filed on 9/5/17.

Boston Chapter, NAACP, Inc., et al. v. Nancy B. Beecher et al., and Pedro Castro et al., v. Nancy B. Beecher et al., U.S. District Court, District of Massachusetts. Retained jointly by Plaintiffs and Defendants. Analysis of qualified labor pool for entry-level police and firefighters. Report filed on 10/11/17.

Winn-Dixie Stores, Inc. and Bi-Lo Holdings, LLC v. Southeast Milk, Inc., et. Al, U.S. District Court, Middle District of Florida, Jacksonville Division. Retained by counsel for Defendants. Analyzed liability and damages in alleged horizontal quantity restriction conspiracy. Report filed on 2/20/18.

Data Breach matter. Retained as statistics expert to analyze patterns of alleged data breach. Case resolved before report or testimony.

Antitrust matter. Retained to analyze procompetitive aspects of allegedly anticompetitive horizontal agreement. Case resolved before report or testimony.

ARTICLES AND PRESENTATIONS

Moderator, “The Capper Volstead Act - Lessons from the Trenches,” ABA Teleconference Panel, December 9, 2016.

Panelist, 43rd Annual Fordham Conference on Antitrust Law and Policy, Economic Workshop – “Preparing for Deposition and Dealing with *Daubert* Challenges”

Expert Witness, ABA Antitrust Spring Meetings Mock Trial, Spring 2015 (Case involved antitrust issues raised by a hypothetical college athletic association’s restrictions on amateur player compensation)

Expert Witness, Antitrust Law & Economics Institute for Federal Judges Mock Trial, October 2015 (Case involved antitrust issues raised by a hypothetical college athletic association’s restrictions on amateur player compensation)

Co-author, “Applying Econometrics to Assess Market Definition and Market Power,” *Econometrics: Legal, Practical, and Technical Issues*, American Bar Association Section of Antitrust Law.

BRYAN RICCHETTI, Ph.D.

Vice President, Cornerstone Research

Co-author, “Antitrust Impact in Indirect Purchaser Class Actions: The Need for Rigorous Analysis of Pass-Through,” in the forthcoming Spring 2015 ABA Antitrust Distribution and Franchising Committee Newsletter

“Interpreting Comcast: Judge Koh’s Decision in *Brazil v. Dole Foods*,” in the Winter 2015 ABA Agriculture and Food Committee Newsletter.

Contributor, “How Effective Are Different Welfare-to-Work Approaches? Five-Year Adult and Child Impacts for Eleven Programs.” December 2001, New York: MDRC.

Co-Author, ABA Handbook, Chapter on Pricing Regulations in the Dairy Industry, *Forthcoming*.

“Testing Disclosure Risk in the proposed SIPP-IRS-SSA Public Use Files,” *Cornell University Dissertation*, August 2007 (and submitted to U.S. Census Bureau Disclosure Review Board, November 2016).

“Turnover as a Gateway to Symmetric Information: Testing Patterns of Entry into Personnel Records,” *Cornell University Dissertation*, August 2007.

“Piece-Rates, Salary, Performance and Job Level,” *Cornell University Dissertation*, August 2007.

ACADEMIC HONORS AND AWARDS

Walter Galenson Fellowship in Labor Economics, Cornell University	Spring 2005
Scholarship Prize in Economics, Hamilton College	Spring 1998

Documents Considered by Bryan Ricchetti, Ph.D.

Legal Pleadings

Defendants' Answer and Affirmative Defenses to the Complaint.	June 29, 2017
Opinion and Order, <i>Floyd et al. v. the City of New York</i> .	May 16, 2012
Plaintiffs' Opposition to Defendants' Joint Motion to Exclude Dwight Steward, Ph.D., as an Expert Witness, <i>Kelly v. Paschall</i> .	February 24, 2005

Expert Report

Expert Report of Bryan Ricchetti, Ph.D. with associated exhibits, appendices, and production.	March 13, 2018
Expert Report of William R. Funderburk with associated exhibits, appendices, and production.	May 8, 2018
Rebuttal Expert Report of Dwight D. Steward, Ph.D. RE: Bryan Ricchetti, Ph.D. with associated exhibits, appendices, and production.	May 8, 2018
Rebuttal Expert Report of Justin McCrary, Ph.D. with associated exhibits, appendices, and production.	July 2, 2018
Rebuttal Expert Report of Patricia Frontiera, Ph.D. with associated exhibits, appendices, and production.	July 2, 2018

Depositions

Deposition of Dwight Steward, Ph.D.	June 22, 2018
-------------------------------------	---------------

Academic Literature

Altonji, Joseph G., and Rebecca M. Blank, "Race and Gender in the Labor Market," Orley C. Ashenfelter and David Card, (Eds.), <i>Handbook of Labor Economics</i> , pp. 3143–3259.	1999
Angrist, Joshua D., and Alan B. Krueger, "Empirical Strategies in Labor Economics," Orley C. Ashenfelter and David Card (Eds.), <i>Handbook of Labor Economics</i> , pp. 1340–1349.	1999
Blau, Francine D., and Lawrence M. Kahn, "Gender Differences in Pay," <i>Journal of Economic Perspectives</i> , 14(4), pp. 75–99.	2000
Card, David, and Jesse Rothstein, "Racial Segregation and the Black-White Test Score Gap," <i>Journal of Public Economics</i> , 91(11-12), pp. 2158–2184.	2007
Chalfin, Aaron, and Justin McCrary, "Criminal Deterrence: A Review of the Literature," <i>Journal of Economic Literature</i> , 55(1), pp. 5–48.	2017
Chetty, Raj, Nathaniel Hendren, and Lawrence F. Katz, "The Effects of Exposure to Better Neighborhoods on Children: New Evidence from the Moving to Opportunity Experiment," <i>American Economic Review</i> , 106(4), pp. 855–902.	2016
Cutler, David M., and Edward L. Glaeser, "Are Ghettos Good or Bad?" <i>Quarterly Journal of Economics</i> , 112(3), pp. 827–872.	1997
Duggan, Mark, Jonathan Gruber, and Boris Vabson, "The Consequences of Health Care Privatization: Evidence from Medicare Advantage Exits," <i>American Economic Journal: Economic Policy</i> , 10(1), p. 153–186.	2018
Fagan, Jeffrey A., et al., "Street Stops and Broken Windows Revisited: The Demography and Logic of Proactive Policing in a Safe and Changing City," Stephen K. Rice and Michael D. White (Eds.), <i>Race, Ethnicity, and Policing: New and Essential Readings</i> , New York University Press, New York and London, pp. 309–348.	2009
Fridell, Lorie, "By The Numbers: A Guide for Analyzing Race Data from Vehicle Stops," <i>Police Executive Research Forum</i> .	2004
Gelman, Andrew, Jeffrey Fagan, and Alex Kiss, "An Analysis of the New York City Police Department's 'Stop-and-Frisk' Policy in the Context of Claims of Racial Bias," <i>Journal of American Statistical Association</i> , 109(479), pp. 813–823.	2007
Greene, William H., <i>Econometric Analysis</i> , 6 th Edition, Pearson Prentice Hall.	2008

Documents Considered by Bryan Ricchetti, Ph.D.

Kennedy, Peter, <i>A Guide to Econometrics</i> , 6 th Edition, Wiley-Blackwell, Malden, Massachusetts.	2008
Moore, D., and McCabe, G., <i>Introduction to the Practice of Statistics</i> , 5 th Edition, W.H. Freeman and Company, New York.	2004
Oster, Emily, “Unobservable Selection and Coefficient Stability: Theory and Evidence,” NBER Working Paper, pp. 1–47.	2016
Rougeau, Vincent D., and Keith N. Hylton, “Lending Discrimination: Economic Theory, Econometric Evidence, and the Community Reinvestment Act,” <i>The Georgetown Law Journal</i> , 85(237), pp. 237–294.	1996
Rubinfeld, Daniel L., “Reference Guide on Multiple Regression,” <i>Reference Manual on Scientific Evidence</i> , 3 rd Edition, Federal Judicial Center, the National Academies Press, Washington, D.C.	2011
Wooldridge, Jeffery M., <i>Introductory Econometrics: A Modern Approach</i> , 5 th Edition, South-Western Cengage Learning, Mason, Ohio.	2012

Data

American Community Survey Five Year Estimates for All Census Tracts in Madison County, Mississippi, Age and Sex	2012–2016
American Community Survey Five Year Estimates for All Census Tracts in Madison County, Mississippi, Employment Status	2012–2016
American Community Survey Five Year Estimates for All Census Tracts in Madison County, Mississippi, Housing Characteristics	2012–2016
American Community Survey Five Year Estimates for All Census Tracts in Madison County, Mississippi, Median Household Income	2012–2016
American Community Survey Five Year Estimates for All Census Tracts in Madison County, Mississippi, Race	2012–2016
American Community Survey Five Year Estimates for All Places in Madison County, Mississippi, Demographic and Housing Estimates	2016
American Community Survey Five Year Estimates for All Census Tracts in Madison County, Mississippi - Geodatabase Format, Shapefiles, available at <i>U.S. Census Bureau</i> , https://www.census.gov/geo/maps-data/data/tiger-data.html .	2015
Tiger/Line Shapefiles: Places - Mississippi, available at <i>U.S. Census Bureau</i> , https://www.census.gov/cgi-bin/geo/shapefiles/index.php?year=2017&layergroup=Places .	2017
“Master CAD Report – To Be Produced.csv.”	2012–2017
“2010 Census Tallies of Census Tracts, Block Groups & Blocks,” available at <i>U.S. Census Bureau</i> , https://www.census.gov/geo/maps-data/data/tallies/tractblock.html .	2010
“2010 Census – Census Tract Reference Map: Madison County, MS,” available at <i>U.S. Census Bureau</i> , https://www2.census.gov/geo/maps/dc10map/tract/st28_ms/c28089_madison/DC10CT_C28089_001.pdf	2010

APPENDIX C: SUPPLEMENTAL ANALYSIS

Exhibit 1

Model from first report^[1]

Variable ^[2]	(1) With DUI Arrests ^[3]	(2) With Traffic Citations/Arrests ^[4]	(3) With Unemployment and Income ^[5]	(4) With Age and Vehicle Ownership ^[6]
Black Percentage of Population	0.02144	0.03193	0.06730	0.06218
standard error	0.00883	0.00921	0.01678	0.01721
p-value	0.01658	0.00073	0.00011	0.00044
Number of DUI Arrests Per 1,000 People	1.26540	1.48120	1.43700	1.38900
standard error	0.09188	0.11370	0.11650	0.12150
p-value	0.00000	0.00000	0.00000	0.00000
Number of Traffic Citations/Arrests Per 1,000 People		-0.11560	-0.08963	-0.10300
standard error		0.03797	0.03978	0.04075
p-value		0.00285	0.02606	0.01281
Median Household Income (in Thousands)			0.03174	0.02669
standard error			0.01528	0.01566
p-value			0.03994	0.09094
Unemployment Rate			-0.05076	-0.07771
standard error			0.07406	0.07727
p-value			0.49440	0.31660
Percentage of Households with At Least One Vehicle				-0.09574
standard error				0.07282
p-value				0.19120
Percentage of Population between Ages 15–24				-0.04544
standard error				0.04742
p-value				0.33980
Constant	-0.24690	-0.26490	-3.54750	7.05080
standard error	0.43940	0.42530	1.73230	7.83940
p-value	0.57520	0.53450	0.04275	0.37030
Observations	126	126	126	126
Adjusted R-Squared	0.625	0.649	0.661	0.662

Source: Master CAD Report – To Be Produced.csv; American Community Survey Five Year Estimates; US Census Bureau

Note:

[1] The dependent variable is the total number of CAD Roadblocks per 1,000 people per year by census tract.

[2] The Census Bureau has yet to release the 2013–2017 American Community Survey Five Year Estimates. Data from the 2012–2016 American Community Survey Five Year Estimates are used for observations in both 2016 and 2017.

[3] Specification (1) uses number of DUI arrests per 1,000 people per year by census tract as a control variable.

[4] Specification (2) uses number of traffic citations and arrests per 1,000 people per year by census tract as a control variable in addition to control variables used in specification (1).

[5] Specification (3) uses median household income and the unemployment rate by census tract as control variables in addition to control variables used in specification (2).

[6] Specification (4) uses the percentage of the population between 15–24 and vehicle ownership by census tract as control variables in addition to control variables used in specification (3).

Exhibit 2

Roadblock model using lagged DUIs and traffic citations^[1]

Variable ^[2]	(1) With Lagged DUI Arrests ^[3]	(2) With Lagged Traffic Citations/ Arrests ^[4]	(3) With Unemployment and Income ^[5]	(4) With Age and Vehicle Ownership ^[6]
Black Percentage of Population	0.02868	0.03902	0.07293	0.06419
standard error	0.01103	0.01176	0.02122	0.02170
p-value	0.01067	0.00126	0.00086	0.00390
Number of DUI Arrests Per 1,000 People in the Previous Year	1.22160	1.41090	1.38420	1.31510
standard error	0.10950	0.13670	0.14200	0.14730
p-value	0.00000	0.00000	0.00000	0.00000
Number of Traffic Citations/Arrests Per 1,000 People in the Previous Year		-0.10240	-0.08153	-0.10660
standard error		0.04571	0.04812	0.05011
p-value		0.02734	0.09336	0.03588
Median Household Income (in Thousands)			0.03377	0.02684
standard error			0.01935	0.01986
p-value			0.08407	0.17980
Unemployment Rate			-0.02180	-0.07226
standard error			0.09820	0.10350
p-value			0.82480	0.48660
Percentage of Households with At Least One Vehicle				-0.15990
standard error				0.09510
p-value				0.09590
Percentage of Population between Ages 15–24				-0.04168
standard error				0.05878
p-value				0.48000
Constant	-0.24900	-0.26550	-3.83670	13.35700
standard error	0.55720	0.54660	2.21510	10.24500
p-value	0.65590	0.62820	0.08638	0.19540
Observations	105	105	105	105
Adjusted R-Squared	0.568	0.585	0.591	0.596

Source: Master CAD Report – To Be Produced.csv; American Community Survey Five Year Estimates; US Census Bureau

Note:

[1] The dependent variable is the total number of CAD Roadblocks per 1,000 people per year by census tract.

[2] The Census Bureau has yet to release the 2013–2017 American Community Survey Five Year Estimates. Data from the 2012–2016 American Community Survey Five Year Estimates are used for observations in both 2016 and 2017.

[3] Specification (1) uses number of DUI arrests per 1,000 people per year by census tract for the previous year as a control variable.

[4] Specification (2) uses number of traffic citations and arrests per 1,000 people per year by census tract for the previous year as a control variable in addition to control variables used in specification (1).

[5] Specification (3) uses median household income and the unemployment rate by census tract as control variables in addition to control variables used in specification (2).

[6] Specification (4) uses the percentage of the population between 15–24 and vehicle ownership by census tract as control variables in addition to control variables used in specification (3).

Exhibit 3

Roadblock model using non-normalized counts of roadblocks, DUIs and traffic citations^[1]

Variable ^[2]	(1) With DUI Arrests and Log of Population ^[3]	(2) With Traffic Citations/Arrests ^[4]	(3) With Unemployment and Income ^[5]	(4) With Age and Vehicle Ownership ^[6]
Black Percentage of Population	0.12500	0.14130	0.23760	0.20860
standard error	0.03136	0.03031	0.05844	0.05903
p-value	0.00011	0.00001	0.00009	0.00059
Number of DUI Arrests	1.05360	1.45830	1.45080	1.35030
standard error	0.08596	0.14020	0.14290	0.14670
p-value	0.00000	0.00000	0.00000	0.00000
Number of Traffic Citations/Arrests		-0.10930	-0.10480	-0.10150
standard error		0.03069	0.03092	0.03044
p-value		0.00053	0.00095	0.00114
Median Household Income (in Thousands)			0.09240	0.06359
standard error			0.05289	0.05349
p-value			0.08322	0.23690
Unemployment Rate			-0.04921	-0.22140
standard error			0.25170	0.26070
p-value			0.84540	0.39750
Percentage of Households with At Least One Vehicle				-0.51320
standard error				0.23710
p-value				0.03250
Percentage of Population between Ages 15–24				-0.23700
standard error				0.16090
p-value				0.14340
Log of Total Population	1.84730	3.34150	2.77860	4.31560
standard error	1.53030	1.52100	1.54280	1.65470
p-value	0.22970	0.02993	0.07423	0.01029
Constant	-15.91100	-28.84600	-33.90100	10.15800
standard error	12.65800	12.62700	13.42000	23.54000
p-value	0.21120	0.02409	0.01284	0.66690
Observations	126	126	126	126
Adjusted R-Squared	0.669	0.698	0.702	0.712

Source: Master CAD Report – To Be Produced.csv; American Community Survey Five Year Estimates; US Census Bureau

Note:

[1] The dependent variable is the total number of CAD Roadblocks per year by census tract.

[2] The Census Bureau has yet to release the 2013–2017 American Community Survey Five Year Estimates. Data from the 2012–2016 American Community Survey Five Year Estimates are used for observations in both 2016 and 2017.

[3] Specification (1) uses number of DUI arrests and log of total population per year by census tract as control variables.

[4] Specification (2) uses number of traffic citations and arrests per year by census tract as a control variable in addition to control variables used in specification (1).

[5] Specification (3) uses median household income and the unemployment rate by census tract as control variables in addition to control variables used in specification (2).

[6] Specification (4) uses the percentage of the population between 15–24 and vehicle ownership by census tract as control variables in addition to control variables used in specification (3).

Exhibit 4

Poisson roadblock model, using non-normalized counts of roadblocks, DUIs and traffic citations^[1]

Variable ^[2]	(1) With DUI Arrests and Log of Population ^[3]	(2) With Traffic Citations/Arrests ^[4]	(3) With Unemployment and Income ^[5]	(4) With Age and Vehicle Ownership ^[6]
Black Percentage of Population	0.01272	0.01309	0.02010	0.01581
standard error	0.00274	0.00261	0.00561	0.00542
p-value	0.00000	0.00000	0.00034	0.00352
Number of DUI Arrests	0.05086	0.08273	0.08056	0.07171
standard error	0.00697	0.00973	0.01055	0.01005
p-value	0.00000	0.00000	0.00000	0.00000
Number of Traffic Citations/Arrests		-0.00817	-0.00771	-0.00722
standard error		0.00197	0.00209	0.00193
p-value		0.00003	0.00022	0.00018
Median Household Income (in Thousands)			0.00586	0.00268
standard error			0.00571	0.00541
p-value			0.30530	0.62020
Unemployment Rate			-0.01410	-0.04090
standard error			0.02725	0.02619
p-value			0.60490	0.11830
Percentage of Households with At Least One Vehicle				-0.06221
standard error				0.02127
p-value				0.00344
Percentage of Population between Ages 15–24				-0.03348
standard error				0.01708
p-value				0.05001
Log of Total Population	0.02614	0.30330	0.27440	0.44890
standard error	0.15750	0.15580	0.15360	0.14890
p-value	0.86820	0.05154	0.07407	0.00257
Constant	1.12380	-1.24750	-1.58360	3.90030
standard error	1.33680	1.34340	1.46870	2.37750
p-value	0.40050	0.35310	0.28090	0.10090
Observations	126	126	126	126

Source: Master CAD Report – To Be Produced.csv; American Community Survey Five Year Estimates; US Census Bureau

Note:

[1] The dependent variable is the total number of CAD Roadblocks per year by census tract. The above results are based on a Poisson regression.

[2] The Census Bureau has yet to release the 2013–2017 American Community Survey Five Year Estimates. Data from the 2012–2016 American Community Survey Five Year Estimates are used for observations in both 2016 and 2017.

[3] Specification (1) uses number of DUI arrests and log of total population per year by census tract as control variables.

[4] Specification (2) uses number of traffic citations and arrests per year by census tract as a control variable in addition to control variables used in specification (1).

[5] Specification (3) uses median household income and the unemployment rate by census tract as control variables in addition to control variables used in specification (2).

[6] Specification (4) uses the percentage of the population between 15–24 and vehicle ownership by census tract as control variables in addition to control variables used in specification (3).

Exhibit 5

Roadblock model excluding any roadblocks, DUIs, and traffic citations within 20 meters of a census tract border^[1]

Variable ^[2]	(1) With DUI Arrests ^[3]	(2) With Traffic Citations/Arrests ^[4]	(3) With Unemployment and Income ^[5]	(4) With Age and Vehicle Ownership ^[6]
Black Percentage of Population	0.02946	0.03327	0.04749	0.05001
standard error	0.00713	0.00701	0.01270	0.01272
p-value	0.00007	0.00001	0.00028	0.00014
Number of DUI Arrests Per 1,000 People	1.04770	1.43590	1.34110	1.31990
standard error	0.13480	0.18210	0.19000	0.18910
p-value	0.00000	0.00000	0.00000	0.00000
Number of Traffic Citations/Arrests Per 1,000 People		-0.11380	-0.08541	-0.08288
standard error		0.03726	0.04075	0.04101
p-value		0.00276	0.03822	0.04552
Median Household Income (in Thousands)			0.00630	0.00330
standard error			0.01108	0.01112
p-value			0.57090	0.76730
Unemployment Rate			-0.07664	-0.06305
standard error			0.05551	0.05586
p-value			0.16990	0.26130
Percentage of Households with At Least One Vehicle				0.03786
standard error				0.04773
p-value				0.42920
Percentage of Population between Ages 15–24				-0.06793
standard error				0.03449
p-value				0.05123
Constant	-0.58100	-0.61020	-1.13470	-3.79440
standard error	0.30150	0.29190	1.24520	5.06250
p-value	0.05630	0.03868	0.36400	0.45500
Observations	126	126	126	126
Adjusted R-Squared	0.522	0.552	0.556	0.567

Source: Master CAD Report – To Be Produced.csv; American Community Survey Five Year Estimates; US Census Bureau

Note: [1] The dependent variable is the total number of CAD Roadblocks per 1,000 people per year by census tract, excluding any observations within 20 meters of a census boundary.

[2] The Census Bureau has yet to release the 2013–2017 American Community Survey Five Year Estimates. Data from the 2012–2016 American Community Survey Five Year Estimates are used for observations in both 2016 and 2017.

[3] Specification (1) uses number of DUI arrests per 1,000 people per year by census tract as a control variable, excluding any observations within 20 meters of a census boundary.

[4] Specification (2) uses number of traffic citations and arrests per 1,000 people per year by census tract as a control variable, excluding any observations within 20 meters of a census boundary, in addition to control variables used in specification (1).

[5] Specification (3) uses median household income and the unemployment rate by census tract as control variables in addition to control variables used in specification (2).

[6] Specification (4) uses the percentage of the population between 15–24 and vehicle ownership by census tract as control variables in addition to control variables used in specification (3).

Exhibit 6

Roadblock models with manual census tract assignment (assignment to least black census tracts)

[1]

Variable ^[2]	(1) With DUI Arrests ^[3]	(2) With Traffic Citations/Arrests ^[4]	(3) With Unemployment and Income ^[5]	(4) With Age and Vehicle Ownership ^[6]
Black Percentage of Population	0.02232	0.03162	0.06865	0.06738
standard error	0.00945	0.01057	0.01859	0.01905
p-value	0.01974	0.00337	0.00034	0.00058
Number of DUI Arrests Per 1,000 People	1.42130	1.49630	1.46860	1.45470
standard error	0.09755	0.10440	0.10440	0.11350
p-value	0.00000	0.00000	0.00000	0.00000
Number of Traffic Citations/Arrests Per 1,000 People		-0.08350	-0.05404	-0.06575
standard error		0.04425	0.04631	0.04779
p-value		0.06151	0.24550	0.17150
Median Household Income (in Thousands)			0.03021	0.02622
standard error			0.01676	0.01712
p-value			0.07397	0.12830
Unemployment Rate			-0.08549	-0.08617
standard error			0.08205	0.08520
p-value			0.29960	0.31390
Percentage of Households with At Least One Vehicle				-0.02922
standard error				0.07918
p-value				0.71280
Percentage of Population between Ages 15–24				-0.06568
standard error				0.05274
p-value				0.21550
Constant	-0.61130	-0.73740	-3.74670	0.31330
standard error	0.48960	0.48920	1.90350	8.45160
p-value	0.21420	0.13430	0.05133	0.97050
Observations	126	126	126	126
Adjusted R-Squared	0.641	0.648	0.660	0.659

Source:

Master CAD Report - To Be Produced.csv; American Community Survey Five Year Estimates, U.S. Census Bureau; Hand Coded CAD Roadblocks and DUIs.xlsx; Duplicate Clean Address by Date.xlsx

Note:

[1] The dependent variable is the hand-coded total number of CAD Roadblocks per 1,000 people per year by census tract.

[2] The Census Bureau has yet to release the 2013–2017 American Community Survey Five Year Estimates. Data from the 2012–2016 American Community Survey Five Year Estimates are used for observations in both 2016 and 2017.

[3] Specification (1) uses the hand-coded number of DUI arrests per 1,000 people per year by census tract as a control variable.

[4] Specification (2) uses number of traffic citations and arrests per 1,000 people per year by census tract, excluding any arrests or citations within 20 meters of a census boundary, as a control variable in addition to control variables used in specification (1).

[5] Specification (3) uses median household income and the unemployment rate by census tract as control variables in addition to control variables used in specification (2).

[6] Specification (4) uses the percentage of the population between 15–24 and vehicle ownership by census tract as control variables in addition to control variables used in specification (3).

EXHIBIT 2

**UNITED STATES DISTRICT COURT
FOR THE SOUTHERN DISTRICT OF MISSISSIPPI
JACKSON DIVISION**

LATOYA BROWN; LAWRENCE
BLACKMON; HERBERT ANTHONY
GREEN; KHADAFY MANNING;
QUINNETTA MANNING; MARVIN
MCFIELD; NICHOLAS SINGLETON;
STEVEN SMITH; BESSIE THOMAS;
and
BETTY JEAN WILLIAMS TUCKER,
individually and on behalf of a class of all
others similarly situated,

Plaintiffs,

v.

MADISON COUNTY, MISSISSIPPI;
SHERIFF RANDALL S. TUCKER, in his
official capacity; and MADISON
COUNTY
SHERIFF'S DEPUTIES JOHN DOES #1
through #6, in their individual capacities,

Defendants.

Civil Action No.

3:17-cv-00347-WHB-LRA

REBUTTAL EXPERT REPORT OF JUSTIN MCCRARY, Ph.D.

July 2, 2018

TABLE OF CONTENTS

1.	QUALIFICATIONS AND ASSIGNMENT	3
1.1.	Qualifications	3
1.2.	Assignment	5
2.	USING GEOGRAPHIC DATA TO TEST HOW OUTCOMES VARY BY RACE ACROSS DIFFERENT NEIGHBORHOODS IS WIDELY ACCEPTED IN THE ACADEMIC LITERATURE AND BY COURTS	7
2.1.	Dr. Steward appears to misunderstand the purpose of Dr. Ricchetti's measure of race, and mischaracterizes his methodology	7
2.2.	Dr. Steward's claims about race and census tracts	12
3.	MEASUREMENT ERROR IS A WELL-UNDERSTOOD FEATURE OF GEOGRAPHIC ANALYSIS THAT TYPICALLY MAKES AN ANALYSIS CONSERVATIVE	14
4.	CONCLUSION	18

1. QUALIFICATIONS AND ASSIGNMENT

1.1. *Qualifications*

1. I am an economist with expertise in economic modeling, statistical methods, and law and economics, among other subjects. I received my A.B. in Public Policy from Princeton University in 1996. After working at National Economics Research Associates in White Plains, New York, and the Federal Reserve Bank of New York from 1996 to 1998, I began my Ph.D. in Economics at the University of California, Berkeley (“Berkeley”), completing the degree in June 2003. After close to five years as Assistant Professor at the University of Michigan (“Michigan”), I became Assistant Professor of Law at Berkeley in January 2008 and was promoted to Professor in July 2010, a position I hold today. While at Berkeley, I have taught courses on introductory, intermediate, and advanced statistics to J.D., L.L.M., and Ph.D. students; on law and economics to J.D. students as well as undergraduates; on labor economics to Ph.D. students in economics and in other fields; and on business law to J.D., L.L.M., and M.B.A. students. In Fall 2017, I took leave from Berkeley and assumed a position as the Samuel Rubin Visiting Professor of Law at the law school of Columbia University (“Columbia”), and effective July 2018, I will join the Columbia law faculty on a permanent basis as the Paul J. Evanson Professor of law. At Columbia, I will teach corporations, antitrust, economics, and statistics.
2. While at Berkeley, I served as the Founding Director of D-Lab, the Social Sciences Data Laboratory at Berkeley, from July 2014 to June 2017, at which point I stepped down to visit Columbia. D-Lab trains graduate students in statistical and data science techniques relevant to modern computation and modern data collections. In addition, the D-Lab archives major data collections, such as those associated with the Census Research Data Centers, the financial market, birth certificate data, and other large-scale collections of import. At D-Lab, I lectured and advised graduate students and faculty regarding high-performance and high-throughput computing, statistical software, and statistical and econometric techniques, including methods for inferring causality from observational data.
3. From September 2009 until July 2014, when I began to direct the D-Lab, I co-directed the Law and Economics Program at Berkeley Law. Since 2017, I have been a member of the Board of Directors of the American Law and Economics Association.

4. Since 2008, I have co-directed the Economics of Crime Working Group of the National Bureau of Economic Research (“NBER”). The NBER is the preeminent professional association of economists in the world, with over 1,400 members worldwide. I was invited to become a Faculty Research Fellow of the NBER in 2006 and remained in that position until 2012, when I was invited to become a Faculty Research Associate, a position I hold today. In my role as co-Director of the Economics of Crime Working Group, I annually review emerging research on criminal enterprises, deterrence theory, and related issues, selecting the best papers on the subject for presentation at conference, and I propose younger scholars for entry to the NBER.
5. As noted, I previously worked at Michigan. From 2003 through 2007, I was Assistant Professor of Public Policy and Assistant Professor of Economics. While at Michigan, I taught introductory statistics and advanced microeconomic theory to M.P.P. students, and advanced econometric theory to Ph.D. students.
6. My research spans a diverse range of topics, including econometric and statistical methodology, crime, employment discrimination, income inequality, education, antitrust, fertility, financial markets, and monetary policy. I have published 18 papers, many of them in leading journals within economics, such as the *American Economic Review*, the *Review of Economics and Statistics*, the *Journal of Economic Literature*, and the *Journal of Econometrics*. According to Google Scholar, six of my papers have been cited over 100 times in the academic literature, with one of those papers, entitled “Manipulation of the Running Variable in the Regression Discontinuity Design” and published in the *Journal of Econometrics*, having been cited over 2,000 times. In addition to my published papers, I am a co-editor of the book *Controlling Crime: Strategies and Tradeoffs*, published by the University of Chicago Press.
7. Over the years, my research has been supported by Michigan, Berkeley, the MacArthur Foundation, the NBER, the National Institutes of Health, the National Science Foundation, the Arnold Foundation, the Spencer Foundation, and the Robert Wood Johnson Foundation.
8. I regularly review articles for the leading peer reviewed journals within economics, including *Econometrica*, the *American Economic Review*, the *Quarterly Journal of Economics*, the *Journal of Political Economy*, the *Review of Economic Studies*, the *Journal of Econometrics*, the *Review of Economics and Statistics*, and the *American*

Law and Economics Review. Peer review specifically focuses on assessing whether submitted manuscripts are employing methodologies that are consistent with academic standards.

9. My consulting experience spans a wide range of industries and markets. For example, I have previously analyzed the extent to which alleged collusive behavior among health care providers affected prices; the extent of infringing sales in a patent lawsuit pertaining to pharmaceuticals; the potential anti-competitive implications of a proposed telecommunications merger; damages associated with an alleged price-fixing conspiracy in the corrugated packaging industry; damages associated with an alleged price-fixing conspiracy in several prominent high-technology product markets; and damages associated with an alleged price-fixing conspiracy in the sale of retail gasoline.
10. In addition to work as a consultant for companies, I often provide consulting for state, local, and federal government, frequently on a *pro bono* basis. Many of these engagements revolve around quantifying the benefits of safety investments, or the extent of differences between racial or ethnic groups, such as differences in income, employment, or arrest rates. All of these engagements have involved the study and use of economics, econometrics, and statistics.
11. Finally, I am frequently invited to give talks regarding the utilization of statistical methodologies in empirical legal studies and from 2011–2015 gave day-long lectures for the annual *Causal Inference Workshop*, as well as its more advanced version, the *Advanced Causal Inference Workshop*. This Spring, I will again participate in the *Causal Inference Workshop*.
12. A copy of my curriculum vitae, including a list of previous testimony and depositions, is included as Appendix A. I am doing this work on a *pro bono* basis. I have been assisted in this matter by staff of Cornerstone Research, who worked under my direction.

1.2. Assignment

13. I have been asked by counsel for Plaintiffs to review the reports of Dr. Steward and Dr. Ricchetti, and comment on Dr. Steward's claim that Dr. Ricchetti's methodology is not a widely-accepted methodology in the academic literature on the economics of crime.

14. As part of my own academic research, I am the co-Director of the Economics of Crime Working Group for the National Bureau of Economic Research, where I annually review emerging empirical research on crime, economics, and related issues, selecting the best papers on the subject for presentation at conference, and I propose younger scholars for entry to the NBER. I have also written extensively on the economics of crime and the statistical methodologies used to analyze the relationship between crime and other factors, including a recently published paper that is the lead article in the *Journal of Economic Literature* summarizing numerous papers that use statistical methods to explore a variety of questions related to crime. I have also written extensively on statistical methods used to analyze outcomes across race. Thus, I have in-depth expertise on the methodologies used in this field.
15. As I explain below, the methods Dr. Ricchetti uses are widely accepted in the academic literature and by Courts. Dr. Steward's claims about the literature are misleading, inaccurate, and reveal a misunderstanding of standard methodological issues.

2. USING GEOGRAPHIC DATA TO TEST HOW OUTCOMES VARY BY RACE ACROSS DIFFERENT NEIGHBORHOODS IS WIDELY ACCEPTED IN THE ACADEMIC LITERATURE AND BY COURTS

16. Dr. Ricchetti's report uses a regression methodology that is standard in the academic literature. Specifically, Dr. Ricchetti analyzes how roadblock frequency varies in neighborhoods of differing racial composition, while controlling for DUI and traffic citations of drivers in each area. As I explain below, this type of regression analysis – in which a researcher analyzes differences in outcomes across geographic areas to understand how different demographic and economic factors affect those outcomes – is one of the most widely used research methods in economics and statistics.
17. Despite the fact that Dr. Ricchetti uses such a standard and widely-accepted methodological approach, Dr. Steward asserts that Dr. Ricchetti's methodology is inconsistent with the academic literature and not reliable. As I explain below, Dr. Steward's assertions misunderstand basic econometric principles and misrepresent the academic literature. Dr. Steward's claims can be organized into two categories, which I address in turn below.

2.1. *Dr. Steward appears to misunderstand the purpose of Dr. Ricchetti's measure of race, and mischaracterizes his methodology*

18. First, Dr. Steward argues that Dr. Ricchetti's use of the share of population that is African-American in a given census tract is not reliable because the share of population in a community that is African-American is not a reliable measure of the share of drivers in a community who are African-American.¹ While I agree with Dr. Steward that controlling for driving behavior is important in an analysis of

¹ Rebuttal Expert Report of Dwight D. Steward, Ph.D. RE: Bryan Ricchetti, Ph.D., May 8, 2018 ("Steward Report"), ¶¶ 39–40 ("[I]t is generally acknowledged in the police racial profiling research literature that the residential population in a given area is not an appropriate measure of the driving population in these types of settings. Further, these studies generally do not indicate that police racial profiling bias can be expected to occur at some specific racial population percentage level as Dr. Ricchetti assumes in his analysis. Dr. Ricchetti appears to be developing some type of new police racial bias theory or is applying the existing racial profiling literature in some novel and untested manner.... In my 19 years of professional experience with working in this area of research, I have not seen police racial bias analysis performed in the manner that Dr. Ricchetti does in his report."). Steward Report ¶, 47 ("It is generally recognized that the driving population on a given road can vary from the residential population in the area of the road for any number of reasons. Commercial and retail activity frequently draws individuals onto area roads that are demographically different from the persons who live in the residences surrounding the roads.").

roadblocks, Dr. Steward's argument misunderstands and misrepresents Dr. Ricchetti's model.

19. I have reviewed Dr. Ricchetti's analysis and model. Dr. Ricchetti's model includes direct controls for drunk driving and traffic violations of *drivers* in each census tract. In other words, Dr. Ricchetti's model controls for the relevant behavior of drivers in each census tract. While Dr. Steward emphasizes the importance of DUIs in the establishment of roadblocks (calling it "the key factor"), Dr. Ricchetti's model controls for DUIs.² Thus, contrary to Dr. Steward's claims and consistent with the literature, Dr. Ricchetti controls for the relevant behavior of driving population in each census tract, given the focus on roadblock policing.
20. I do not understand Dr. Ricchetti's model's use of the share of African-Americans living in a census tract as a proxy for the share of drivers in that census tract that are African-American. Instead, Dr. Ricchetti's model uses the share of population that is African-American in each census tract to test of whether there are more roadblocks in some areas of the county than others, *controlling for driving behavior*.
21. This type of model, in which a researcher looks at differential policing across different neighborhoods based on racial breakdown of residents in the neighborhood while controlling for relevant crime in each neighborhood, has been used in both academic research and relied on by Courts. I am the author of a paper that surveys key papers in the economic and statistics literature on crime.³ In that paper, I cite to a paper by Jeff Fagan and co-authors ("Fagan et al.") as an example that uses the same general type of model Dr. Ricchetti uses to assess whether the Stop, Question, and Frisk program in New York City (SQF) was used more heavily in minority neighborhoods, while controlling for crime levels.⁴ As in Dr. Ricchetti's

² See, for example, Steward Report, ¶ 11 ("... DUI activity and not race, is the key factor in MCSD traffic roadblock location placement."); Steward Report, ¶ 58 ("It my understanding that MCSD receives grant funding from Mississippi Office of Highway Safety (MOHS) in its efforts to reduce the incidents of drunk driving and to assist with cost of establishing DUI traffic roadblocks. It is my understanding that the grant funding is subject to periodic renewal and is contingent on satisfactory achievement of DUI enforcement. Even a cursory look at the traffic roadblock and CAD data shows that the DUI activity in a geographical area during a specific time period is correlated with an increased number of traffic roadblocks in the geographical area in later time periods.").

³ Chaffin, Aaron, and Justin McCrary, "Criminal Deterrence: A Review of the Literature," *Journal of Economic Literature*, 55(1), 2017, pp. 5–48.

⁴ Chaffin, Aaron, and Justin McCrary, "Criminal Deterrence: A Review of the Literature," *Journal of Economic Literature*, 55(1), 2017, pp. 5–48, at p. 21; Fagan, Jeffery A., et al., "Street Stops and Broken Windows Revisited: The Demography and Logic of Proactive Policing in a Safe and Changing City," Stephen K. Rice and Michael D. White

- model, Fagan et al. examined whether the intensity of a particularly type of policing effort varied across neighborhoods based on the racial distribution of *the residents* in that neighborhood, given the level of relevant crimes committed in those neighborhoods. Prof. Fagan and his co-authors have in fact published several articles using this broad methodology.⁵ I also understand that Prof. Fagan's methodology was used in *Floyd et al. v. the City of New York* and the model was accepted by the Courts.⁶ Such an approach can be (and, in this particular instance in my opinion, is) a methodologically appropriate approach to determine whether there is a statistically significant relationship between roadblock placement and the racial composition of a census tract, conditional on other factors.
22. More generally, the literature on crime and policing regularly leverages different levels of crime and policing across different geographic areas (cities, counties, etc.) to understand the relationships between crime, policing, and local characteristics of different geographic areas.⁷ Dr. Ricchetti's general methodology of using differences across geographic areas to analyze a relationship between roadblocks, drunk driving, and other traffic offenses, and neighborhood characteristics employs an accepted methodology that is widely applied to many questions. For example, this general methodology broadly parallels that used in an article by Sarath Sanga on race and policing in Oakland in a leading peer review journal.⁸
 23. The general model Dr. Ricchetti uses is also commonly employed to investigate how differences across neighborhoods affects a variety of different social, political, and economic outcomes. For example, the model is commonly used in studies examining voting patterns across localities. Typical of this approach is a recent paper by Elizabeth Cascio and Ebonya Washington examining the connection

(Eds.), *Race, Ethnicity, and Policing: New and Essential Readings*, New York University Press, New York and London, 2009, pp. 309–348.

⁵ See, for example, Gelman, Andrew, Jeffrey Fagan, and Alex Kiss, “An Analysis of the New York City Police Department's ‘Stop-and-Frisk’ Policy in the Context of Claims of Racial Bias,” *Journal of American Statistical Association*, 109(479), 2007, pp. 813–823.

⁶ Opinion and Order, *Floyd et al. v. the City of New York*, May 16, 2012 at pp. 6–7.

⁷ For example, my paper with Aaron Chalfin summarizes a large academic literature that utilizes aggregate data at different geographic levels to analyze factors that contribute to different levels of crime and policing across different geographic areas. Some of those papers include control variables for demographic factors like race. Chalfin, Aaron, and Justin McCrary, “Criminal Deterrence: A Review of the Literature,” *Journal of Economic Literature*, 55(1), 2017, pp. 5–48.

⁸ Sanga, Sarath, “Does Officer Race Matter?” *American Law and Economics Review*, 16(2), 2014, pp. 403–432, especially Section 6.

between the Voting Rights Act and redistribution of state funds (“Cascio and Washington”). This paper was published in another leading peer review journal, the *Quarterly Journal of Economics*.⁹

24. The type of regression used by Cascio and Washington is analogous to regression models involving controls for area racial composition in a vast array of voting rights cases. These cases are too numerous to mention here but are summarized in detail in *Quiet Revolution in the South*, a leading monograph published by one of the top academic presses in the world, the Princeton University Press (“Quiet Revolution”).¹⁰ *Quiet Revolution* is also an important work of social science literature and draws upon the same type of regression analysis Dr. Ricchetti employs in his report.
25. The type of model Dr. Ricchetti uses is also a common model used for understanding how different economic outcomes differ across neighborhoods of differing racial composition. For example, area-level measures of racial composition are employed by David Card and Jesse Rothstein in a paper examining the empirical relationship between racial composition in census tracts and the black-white test score gap.¹¹ Ed Glaeser and David Cutler of Harvard used the same broad methodology to analyze how employment and school outcomes differ across census tracts with different degrees of racial segregation.¹² There is also a literature that uses the same methodology to analyze how mortgage lending outcomes vary with the racial composition of neighborhoods.¹³
26. I have three final comments on Dr. Ricchetti’s model. First, in my experience with the literature, a relative strength of Dr. Ricchetti’s model as applied to the context at hand is that it tests the relationship between race and law enforcement with respect to a relatively narrow policing activity that has a measurable objective that both

⁹ Cascio, Elizabeth U., and Ebonya Washington “Valuing the Vote: The Redistribution of Voting Rights and State Funds following the Voting Rights Act of 1965,” *Quarterly Journal of Economics*, 129(1), 2014, pp. 379–433, especially at pp. 389–393.

¹⁰ Davidson, Chandler, and Bernard Grofman (Eds.), *Quiet Revolution in the South: The Impact of the Voting Rights Act, 1965-1990*, Princeton University Press, Princeton, NJ, 1994.

¹¹ Card, David, and Jesse Rothstein, “Racial Segregation and the Black-White Test Score Gap,” *Journal of Public Economics*, 91(11-12), 2007, pp. 2158–2184.

¹² Cutler, David M., and Edward L. Glaeser, “Are Ghettos Good or Bad?” *Quarterly Journal of Economics*, 112(3), 1997, pp. 827–872.

¹³ Rougeau, Vincent D., and Keith N. Hylton, “Lending Discrimination: Economic Theory, Econometric Evidence, and the Community Reinvestment Act,” *The Georgetown Law Journal*, 85(237), 1996, pp. 237–294, at pp. 269-270, 277, 289.

experts generally agree upon – namely the reduction of unsafe driving. As noted above, Dr. Steward agrees that the objective of roadblocks is the reduction of unsafe driving and cites to documents in his own report to support this claim.¹⁴ Further, both Dr. Steward and Dr. Ricchetti have access to data from the sheriff's department tracking DUIs and other traffic offenses, and both have argued DUIs are the key factor that correlates with roadblocks. Often times in academic research on crime, the outcomes being analyzed have complex causal chains and not all data is available, making the conclusions that can be drawn relatively weaker than those Dr. Ricchetti is able to draw here.

27. Second, Dr. Steward claims that Dr. Ricchetti's analysis somehow assumes that "police racial profiling bias can be expected to occur at some specific racial population percentage level."¹⁵ I have reviewed Dr. Ricchetti's model, and I do not understand it to be making any such assumption. Dr. Ricchetti's regression model simply analyzes the relationship between the share of population that is African-American in each census tract and roadblock frequency. I do not understand his analysis to impose assumptions regarding the form of any racial bias on the part of police. Dr. Steward's claims on this point appear to stem from his misunderstanding of a set of descriptive statistics in Dr. Ricchetti's first report. Dr. Ricchetti's regression analysis – which is the formal statistical test of the relationship between race and roadblocks – imposes no such assumption.
28. Third, Dr. Steward criticizes the descriptive statistics section of Dr. Ricchetti's report.¹⁶ While it is true Dr. Ricchetti presents a set of summary statistics that identify what a statistician would call a "bi-modal distribution" of race across census tracts (i.e., the share of African-Americans in each census tract clusters around two levels – less than 25% or approximately 50% or more), Dr. Ricchetti's use of summary statistics to describe relevant patterns in the data before running his full regression model is a common approach in nearly every academic paper that uses regression. Such statistics are not meant to be offered as a formal statistical test, as Dr. Steward claims, and instead provide relevant background regarding the variation in racial composition across census tracts before running a formal regression model.

¹⁴ Steward Report, ¶¶ 57–61.

¹⁵ Steward Report, ¶ 39.

¹⁶ Steward Report, ¶¶ 34–39.

2.2. Dr. Steward's claims about race and census tracts

29. The second criticism Dr. Steward offers of Dr. Ricchetti's use of geographic data is equally misplaced. Dr. Steward asserts that the fact that there is variation within each census tract in the share of the population that is African-American "further undercuts the reliability of his analyses."¹⁷ This assertion by Dr. Steward reveals a basic misunderstanding of geographic data, is inconsistent with basic econometric methods used in a great many published papers, and is simply inaccurate.
30. As discussed above in Section 2.1, it is common for academic papers to use data aggregated to a geographic level (like a census tract) to analyze crime and policing, as well as different outcomes by race more generally. Multiple notable academic studies that have analyzed how the racial composition of a neighborhood affects economic outcomes use census tract data.¹⁸ In fact, the U.S. Department of Housing and Urban Development ("HUD") developed a randomized social experiment in the 1990's (called Moving to Opportunity ("MTO")) to analyze the effect of moving from a relatively higher poverty neighborhood to a relatively lower poverty neighborhood on children's educational and economic outcomes.¹⁹ The MTO study defined neighborhoods as census tracts, and the data from the MTO study has been analyzed by leading economists in top academic journals, including Raj Chetty and Larry Katz.²⁰
31. Thus, the use of census tract level data – or county data, or city data, or state data – is common in academic research, and is in no way invalidated because the values of the variables vary within a census tract (or county, or city, or state) as Dr. Steward asserts. This feature of data is true for any variable that is measured at an aggregate geographic level, such as census tract, county, city, or state level. Consequently, statistical analyses comparing differences across neighborhoods in policing or any other outcome of interest can be a reliable methodology. Any conclusion to the contrary would be overly broad and incorrect. In fact, I understand Dr. Steward has

¹⁷ Steward Report, ¶ 46.

¹⁸ Card, David, and Jesse Rothstein, "Racial Segregation and the Black-White Test Score Gap," *Journal of Public Economics*, 91(11-12), 2007, pp. 2158–2184; Cutler, David M., and Edward L. Glaeser, "Are Ghettos Good or Bad?" *Quarterly Journal of Economics*, 112(3), 1997, pp. 827–872. Both papers use census tracts.

¹⁹ "Moving to Opportunity for Fair Housing," available at *U.S. Department of Housing and Urban Development*, <https://www.hud.gov/programdescription/mto>

²⁰ Chetty, Raj, Nathaniel Hendren, and Lawrence F. Katz, "The Effects of Exposure to Better Neighborhoods on Children: New Evidence from the Moving to Opportunity Experiment," *American Economic Review*, 106(4), 2016, pp. 855–902.

relied on comparisons of arrest data across geographic areas much bigger than census tracts in a benchmarking analysis in a prior matter where he served as the Plaintiff's expert.²¹

32. In fact, the use of aggregate data within a geographic unit is well understood to be a particular type of measurement error that does not create bias in favor of finding a statistically significant coefficient on race in a regression analysis. As I explain in more detail in the next section, if anything this type of measurement issue typically makes a model like Dr. Ricchetti's conservative.

²¹ Plaintiffs' Opposition to Defendants' Joint Motion to Exclude Dwight Steward, Ph.D., as an Expert Witness, *Kelly v. Paschall*, February 24, 2005.

3. MEASUREMENT ERROR IS A WELL-UNDERSTOOD FEATURE OF GEOGRAPHIC ANALYSIS THAT TYPICALLY MAKES AN ANALYSIS CONSERVATIVE

33. Dr. Steward points to two examples of a standard methodological issue in econometrics known as measurement error and suggests that such measurement errors render Dr. Ricchetti's analysis unreliable. As I describe below, Dr. Steward's arguments on these points are methodologically unsound, unsupported by the literature, and misunderstand measurement error and the associated statistical theory. I note that I have written specifically on the subject of measurement error in criminal justice and am familiar with the extensive literature on the subject.²²

3.1.1. *Measurement error in the number of roadblocks*

34. First, Dr. Steward claims that the fact that some of the roadblocks that Dr. Ricchetti analyzes occur on the boundary of census blocks makes it "difficult, if not impossible, to determine the level and direction of the errors that his faulty methodology introduces into his analysis,"²³ and that it "is unacceptable and unreasonable to assume that his errors will 'wash out' in the end."²⁴ Dr. Steward's statements are incorrect and methodologically unsound. In fact, in his deposition testimony, Dr. Steward appears to misunderstand the definition of measurement error.²⁵

35. It is well understood in economics and statistics that nearly all data sources have imperfections in them that introduce the possibility of what economists refer to as measurement error.²⁶ Importantly, the effect of measurement error in a context such as that analyzed by Dr. Ricchetti is not to make analysis "impossible," but instead

²² Chalfin, Aaron, and Justin McCrary, "Are U.S. Cities Underpoliced? Theory and Evidence," *Review of Economics and Statistics*, 100(1), 2018, pp. 167–186.

²³ Steward Report, ¶ 32.

²⁴ Steward Report, ¶ 32.

²⁵ Deposition of Dwight Steward, Ph.D., June 22, 2018, pp. 186:17–187:10 ("Q. And what is your understanding of that term [measurement error]? A. Measurement error is not data error. Measurement error is a completely statistical term. And again, it has to do with a tool, not with the data. Measurement error just has to do with accounting for the fact that there are going to be some things you can't measure. The classic example is fire in the belly when you're looking at salary. You're going to have some people that work really hard and other people that don't really hard. But on average, when you're doing a salary analysis, it balances out.").

²⁶ Angrist, Joshua D., and Alan B. Krueger, "Empirical Strategies in Labor Economics," Orley C. Ashenfelter and David Card (Eds.), *Handbook of Labor Economics*, 1999, pp. 1277–1366, at pp. 1339–1340.

to make an analysis conservative. For example, a leading econometrics textbook notes the following:²⁷

“The usual assumption is that the measurement error in [a dependent variable] is statistically independent of each explanatory variable. If this is true, then the OLS estimators [the regression coefficients] are unbiased and consistent. Further, the usual OLS inference procedures (*t*, *F*, *LM* statistics are valid)... measurement error in the dependent variable results in a larger variance than when no error occurs; this, of course, results in larger variances of the OLS estimators.... The bottom line is that, if the measurement error is uncorrelated with the independent variables, then OLS estimation has good properties.”

36. As described in the above quote, the existence of measurement error in the dependent variable (the issue Dr. Steward focuses on) typically has *no effect* on the reliability of a regression model. The only effect of measurement error is to increase the variance of the model, which makes it *harder* to find a statistically significant effect for any variable in the model. Thus, to the extent there is measurement error in Dr. Ricchetti’s model, the statistical significance of the race variable is conservative.
37. One way in which the measurement error Dr. Steward identifies could conceivably change Dr. Ricchetti’s findings is if the roadblocks on boundaries were systematically mis-assigned to census tracts in a very specific way that correlated, after controlling for the other covariates in his model, with census tract racial composition.²⁸ Importantly, there are standard ways to test for such a concern. For example, one way to test for such a concern is to run robustness tests that exclude from the model any data points in which measurement error might be a problem.²⁹

²⁷ Wooldridge, Jeffery M., *Introductory Econometrics: A Modern Approach*, 5th Edition, South-Western Cengage Learning, Mason, Ohio, 2012, pp. 318–319.

²⁸ Wooldridge, Jeffery M., *Introductory Econometrics: A Modern Approach*, 5th Edition, South-Western Cengage Learning, Mason, Ohio, 2012, p. 320 (“The bottom line of this subsection is that measurement error in the dependent variable *can* cause biases in OLS if it is systematically related to one or more of the explanatory variables. If the measurement error is just a random reporting error that is independent of the explanatory variables, as is often assumed, then OLS is perfectly appropriate.”).

²⁹ Rubinfield, Daniel L., “Reference Guide on Multiple Regression,” *Reference Manual on Scientific Evidence*, 3rd Edition, Federal Judicial Center, the National Academies Press, Washington, D.C., 2011, p. 327 (“In general, it is important to explore the reasons for unusual data points. If the source is an error in recording data, the appropriate corrections can be made. If all the unusual data points have certain characteristics in common (e.g., they all are associated with a supervisor who consistently gives high ratings in an equal pay case), the regression model should be modified appropriately. One

Rather than use those standard tests, Dr. Steward simply asserts measurement error is a problem. Dr. Steward does not in any way *test* whether it affects Dr. Ricchetti's findings. Based on standard econometric conclusions, the expectation for this type of measurement error would in fact be for it to "wash out" in the analysis. Dr. Steward makes no attempt to demonstrate that his concern is well-founded. In my opinion, the type of measurement error Dr. Steward identifies is highly unlikely to affect Dr. Ricchetti's conclusions, except by making them somewhat conservative from a statistical perspective.

38. Further, and more practically, I have reviewed Dr. Ricchetti's rebuttal report, and understand that when he removes the roadblocks on or near boundaries (the roadblocks that could be subject to measurement error), his main findings are unchanged. Dr. Ricchetti also runs a sensitivity in which he moves all roadblocks on the boundary into the census tract they border with the lowest African-American share. This sensitivity directly tests Dr. Steward's concern that the relationship between roadblocks and African-American share that Dr. Ricchetti finds is driven entirely by how data points on the boundary are assigned to census tracts. Dr. Ricchetti's findings again remain unchanged despite this assumption. These types of sensitivities indicate that any measurement error introduced by the existence of roadblocks on boundaries is not driving Dr. Ricchetti's results.
39. More generally, in my professional experience publishing papers, serving as a referee, determining tenure for junior scholars, and writing on criminal justice from an empirical perspective, it is my view that the type of data issue that Dr. Steward highlights is present in some form in a great number of empirical analyses and that the presence of some form of imperfection in data does not on its own necessarily render such analyses scientifically unreliable. To argue that, because imperfections such as those that are present in the data Dr. Ricchetti employs, an analysis should not be conducted, or is unreliable, is not standard.

3.1.2. Measurement error in the share of African-Americans by census tract

generally useful diagnostic technique is to determine to what extent the estimated parameter changes as each data point in the regression analysis is dropped from the sample."); Angrist, Joshua D., and Alan B. Krueger, "Empirical Strategies in Labor Economics," Orley C. Ashenfelter and David Card (Eds.), *Handbook of Labor Economics*, 1999, pp. 1277–1366, at p. 1347 ("Researchers have employed a variety of 'trimming' techniques to try to minimize the effects of observations that may have been misreported.").

40. As noted above, Dr. Steward also asserts that the fact that there is variation within each census tract in the share of the population that is African-American “further undercuts the reliability of his analyses.”³⁰ As discussed above in Section 2, there are a great number of academic papers that use data aggregated to a geographic level (like a census tract) to analyze crime and policing, as well as different outcomes by race. The use of census tract level data is in no way invalidated because the values of the variables vary within a census tract. This feature of data is true for any variable that is analyzed at a census tract, county, city, or state level. Dr. Steward is simply wrong that this aspect of Dr. Ricchetti’s analysis “undercuts [its] reliability.”
41. In fact, measurement error in a control variable (like the share of the population in a census tract that is African-American) is typically understood to make the estimate of a coefficient *smaller* than otherwise would be the case. In fact, and as noted, one of my published papers on crime and policing focuses specifically on how the presence of measurement error will understate the relationship between policing and crime. In that paper, I described the concern of measurement error in a predicting variable as follows:³¹

“An obvious way to improve the precision of police elasticities is to return to regression-based methods with appropriate controls, as in Marvell and Moody (1996), for example. Importantly, however, this type of approach has the potential to run afoul of the ‘iron law of econometrics,’ or the tendency of regression coefficients to be too small because of errors in the measurement of the variable of interest (Hausman 2001).”

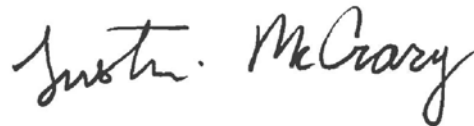
³⁰ Steward Report, ¶ 46.

³¹ Chalfin, Aaron, and Justin McCrary, “Are U.S. Cities Underpoliced? Theory and Evidence,” *Review of Economics and Statistics*, 100(1), 2018, pp. 167–186.

4. CONCLUSION

42. In sum, based on my review of Dr. Steward's and Dr. Ricchetti's reports, it is my view that Dr. Ricchetti's statistical model is a commonly-used and widely-accepted methodology in both the academic literature and by the Courts in litigation. Dr. Steward's claims to the contrary are simply not supported. In fact, as noted above, Dr. Steward has relied on the same methodology of comparing policing outcomes across different broad geographic regions himself in a prior case.
43. Additionally, Dr. Steward's claim that the existence of roadblocks on the boundary of census tracts renders Dr. Ricchetti's analyses unreliable is not correct. Dr. Steward's claims on this subject are contradicted by standard econometric methodology covered in basic textbooks, and by the large academic literature in economics and statistics on measurement error. Dr. Ricchetti's approach of using sensitivity analyses to test the potential effect of measurement error is a standard approach to this problem. The fact that Dr. Steward did not run any such tests to support his claims is not an accepted approach.

Executed on July 2, 2018

A handwritten signature in black ink that reads "Justin. McCrary". The signature is written in a cursive, slightly informal style.

Justin McCrary, Ph.D.

Appendix A

Justin McCrary

Columbia University
School of Law
632 Jerome Greene Hall
New York, NY 10027

Cell Phone: (510) 409-6418
Email: justin.mccrary@gmail.com
Homepage: <http://econ.berkeley.edu/~jmccrary>

University of California, Berkeley
School of Law
586 Simon Hall
Berkeley, CA 94708

Current Appointments

Columbia University
2018– Paul J. Evanson Professor of Law (effective July 1, 2018)

University of California, Berkeley
2010– Professor of Law
2008–10 Assistant Professor of Law

National Bureau of Economic Research
2012– Faculty Research Associate
2006–12 Faculty Research Fellow

Past Appointments

Columbia University
Fall 2017 Samuel Rubin Visiting Professor of Law

University of California, Berkeley
2014–17 Director, Social Sciences Data Laboratory (D-Lab)

University of Michigan
2003–07 Assistant Professor, Gerald R. Ford School of Public Policy
2003–07 Assistant Professor, Department of Economics (courtesy)

Education

Ph.D. Economics, University of California, Berkeley, 2003

A.B. Public Policy, Princeton University, 1996

Testimony Experience

In Re: RFC and ResCap Liquidating Trust Litigation

U.S. District Court for the District of Minnesota and

U.S. Bankruptcy Court for the Southern District of New York

Mortgage-backed securities case

Testimony regarding sampling, damages, and statistical concepts

Retained by Advanced Financial Services, BMO Harris Bank, Cadence Bank, Colonial Savings, CTX Mortgage, Decision One, First Guaranty, Freedom Mortgage, Home Loan Center, HSBC Mortgage, Impac Funding, PNC, Provident, Standard Pacific, Synovus, and Universal American

Report filed on June 15, 2018

Deposed on April 24, 2018

Rebuttal to supplemental disclosure filed on February 26, 2018

Rebuttal report filed on October 27, 2017

Tri-City, LLC; Endor Car and Driver, LLC; Zehn-NY, LLC; Zwei-NY, LLC; Abatar, LLC; and Flatiron Transit, LLC v. New York Taxi and Limousine Commission and Meera Joshi

Supreme Court of the State of New York, County of New York

Article 78 proceeding challenging an administrative ruling

Testimony regarding mismatch between accessibility regulation and accessibility demand

Retained by plaintiffs

Supplemental report filed on May 18, 2018

Affirmative report filed on April 13, 2018

Federal Home Loan Bank of Boston, v. Ally Financial, Inc., et al.

Superior Court of the State of Massachusetts, Business Litigation Session, Suffolk County

Mortgage-backed securities case

Testimony regarding sampling and statistical methods

Retained by Morgan Stanley

Rebuttal report filed on May 17, 2018

Cheryl Phipps and Shawn Gibbons v. Wal-Mart Stores, Inc.

United States District Court for the Middle District of Tennessee

Putative class action alleging discrimination in employment

Testimony regarding the decentralized nature of Walmart's internal labor market and concomitant heterogeneity across proposed class members in pay and promotion outcomes

Retained by Walmart

Deposed on April 30, 2018

Rebuttal report filed on April 20, 2018

People of the State of California v. Morgan Stanley & Co.

Superior Court of the State of California, County of San Francisco

Mortgage-backed securities case

Testimony regarding sampling and statistical methods

Retained by Morgan Stanley & Co.

Deposed on February 9, 2018

Rebuttal report filed on January 25, 2018

Tony Dickey and Paul Parmer et al. v. Advanced Micro Devices, Inc.

U.S. District Court for the Northern District of California

Putative class action alleging false advertising

Testimony regarding availability of information regarding and market for computer chips and heterogeneity across putative class members

Retained by Advanced Micro Devices

Rebuttal report filed on January 26, 2018

Martin Dulberg et al. v. Uber Technologies, Inc. and Rasier, LLC

U.S. District Court for the Northern District of California

Putative class action alleging breach of contract

Testimony regarding heterogeneity in damages across putative class members

Retained by Uber Technologies, Inc.

Affirmative report filed on January 11, 2018

Federal Home Loan Bank of Chicago v. Banc of America Funding Corporation, et al.

Circuit Court of Cook County, Illinois, County Department, Chancery Division

Mortgage-backed securities case

Testimony regarding sampling, regression, and statistical methods

Retained by Morgan Stanley

Deposed on December 14, 2017

Rebuttal report filed on August 21, 2017

In re Lehman Brothers Holdings, Inc., et al., Debtors

U.S. Bankruptcy Court for the Southern District of New York

Mortgage-backed securities case

Testimony regarding sampling, resampling methods for inference, and statistical methods

Retained by Lehman Brothers Holdings, Inc.

Deposed on October 9, 2017

Rebuttal report filed on August 28, 2017

In re Gateway Plaza Residents Litigation

Supreme Court of the State of New York, County of New York

Putative class action regarding warranty of habitability

Testimony regarding electricity usage, individual preferences and choices, and heterogeneity across putative class members; large scale data analysis

Retained by Gateway Plaza

Class certification report filed on September 18, 2017

Shamrell v. Apple Inc.

Superior Court of the State of California, County of San Diego

Putative class action regarding products liability, Unfair Competition Law and Consumers Legal Remedies Act

Testimony regarding heterogeneity across putative class members, failure rate methodologies, econometrics, and data science

Retained by Apple, Inc.

Class certification report filed on March 29, 2017

Rebuttal report filed on February 1, 2017

Deutsche Bank National Trust Company v. Morgan Stanley Mortgage Capital Holdings LLC

U.S. District Court for the Southern District of New York

Mortgage-backed securities case

Testimony regarding sampling and statistical methods

Retained by Morgan Stanley Mortgage Capital Holdings LLC

Deposed on March 27, 2017

Rebuttal report filed on December 16, 2016

Rosen v. Uber Technologies, Inc.

U.S. District Court for the Northern District of California

Putative class action regarding false advertising

Testimony regarding economics of safety

Retained by Uber Technologies, Inc.

Deposed on February 3, 2017

Rebuttal report filed on January 13, 2017

Affirmative report filed on December 2, 2016

Blackrock Allocation Target Shares: Series S Portfolio, et al., v. Wells Fargo Bank, N.A.; Royal Park Investments SA/NV v. Wells Fargo Bank, N.A., as Trustee; National Credit Union Administration Board, et al., v. Wells Fargo Bank, N.A.; Phoenix Light SF Limited, et al., v. Wells Fargo Bank, N.A.; and Commerzbank AG v. Wells Fargo Bank, N.A.

U.S. District Court for the Southern District of New York

Mortgage-backed securities case

Testimony regarding sampling and statistical methods

Retained by Wells Fargo Bank

Report filed on January 18, 2017

LA Taxi Cooperative, Inc. et al. v. Uber Technologies, Inc.

U.S. District Court for the Northern District of California

False advertising case

Testimony regarding economics of safety

Retained by Uber Technologies, Inc.

Rebuttal report filed on January 13, 2017

Affirmative report filed on November 18, 2016

State of Illinois v. Hitachi Ltd., et al.

Circuit Court of Cook County, Illinois, County Department, Chancery Division

Antitrust price-fixing case

Testimony regarding liability and damages

Retained by Hitachi Ltd.

Report filed on November 11, 2016

In re: City of San Bernardino, California, Debtor

U.S. Bankruptcy Court, Central District of California, Riverside Division

Municipal bankruptcy case

Testimony regarding economics, econometrics, rare risks and the value of a statistical life

Retained by the City of San Bernardino

Report filed on October 3, 2016

U.S. Bank National Association v. Morgan Stanley Mortgage Capital Holdings LLC
Supreme Court of the State of New York, County of New York
Mortgage-backed securities case
Testimony regarding sampling and statistical methods
Retained by Morgan Stanley Mortgage Capital Holdings LLC
Deposed on September 10, 2016
Report filed on June 17, 2016

National Credit Union Administration Board v. RBS Securities, Inc.
U.S. District Court for the Central District of California &
U.S. District Court for the District of Kansas
Mortgage-backed securities case
Testimony regarding sampling and statistical methods
Retained by RBS Securities
Deposed on January 28, 2016
Report filed on October 16, 2015

Temple-Inland, Inc., v. Thomas Cook, et al.
U.S. District Court for the District of Delaware
Escheat law case
Testimony regarding sampling, statistical methods, and economic theory
Retained by the State of Delaware
Deposed on November 24, 2015
Report filed on October 23, 2015

National Consumer Protection Service v. Farmacias Cruz Verde S.A. et al.
Honorable Civil Court of Santiago (Chile)
Antitrust putative class action
Testimony regarding appropriate methods for estimating damages
Retained by Salcobrand
Report filed on November 14, 2015

Douglas O'Connor, et al., v. Uber Technologies, Inc.
U.S. District Court for the Northern District of California
Putative class action regarding independent contractor versus employee
Testimony regarding heterogeneity in alleged damages across putative class members, potential for class conflict
Retained by Uber Technologies, Inc.
Report filed on October 27, 2015
Report filed on July 7, 2015

Students for Fair Admissions, Inc. v. President and Fellows of Harvard College
U.S. District Court for the District of Massachusetts
Discovery dispute in affirmative action case
Testimony regarding necessary inputs into statistical methodologies
Retained by Harvard College
Report filed on July 30, 2015

Securities and Exchange Commission v. James V. Mazzo and David L. Parker

U.S. District Court for the Central District of California

Civil insider trading suit

Testimony regarding probability theory and statistics

Retained by James V. Mazzo and David L. Parker

Deposed on May 13, 2015

Report filed on March 13, 2015

In re: City of Stockton, California, Debtor

U.S. Bankruptcy Court, Eastern District of California

Municipal bankruptcy suit

Testimony regarding economic theory, labor economics, and econometrics

Retained by the City of Stockton

Deposed on March 13, 2013

Report filed on February 15, 2013

In the Matter of Act 111 Interest Arbitration Between Commonwealth of Pennsylvania and Pennsylvania State Troopers Association

Hearings on wage setting

Testimony regarding rare risks and the value of a statistical life

Retained by the Pennsylvania State Troopers Association

Testimony given on December 4, 2012

Report filed on December 4, 2012

Scholarship on Sampling, Statistics, and Econometrics

Conservative Tests Under Satisficing Models of Publication Bias (with Garret Christensen and Daniele Fanelli)

PLOS One, Volume 11, Number 2, February 22, 2016

New Evidence on the Finite Sample Properties of Propensity Score Matching and Reweighting Estimators (with Matias Busso and John DiNardo)

Review of Economics and Statistics, Volume 96, Number 5, December 2014

Incomes in South Africa Since the Fall of Apartheid (with Murray Leibbrandt and James Levinsohn)

Journal of Globalization and Development, Volume 1, Issue 1, January 2010

Manipulation of the Running Variable in the Regression Discontinuity Design: A Density Test

Journal of Econometrics, Volume 142, Issue 2, February 2008

Scholarship on Risk and Crime

Are U.S. Cities Underpoliced? Theory and Evidence (with Aaron Chalfin)

Review of Economics and Statistics, Volume 100, Issue 1, March 2018, 167–186

Criminal Deterrence: A Review of the Literature (with Aaron Chalfin)

Journal of Economic Literature, Volume 55, Number 1, March 2017, 5–48 (lead article)

The Deterrence Effect of Prison: Dynamic Theory and Evidence (with David S. Lee)

Advances in Econometrics, Volume 38, 2017

Do Sexually Violent Predator Laws Violate Double Jeopardy or Substantive Due Process: An Empirical Inquiry (with Tamara Lave)

Brooklyn Law Review, Volume 78, Summer 2013, Number 4, 1391–1439

General Equilibrium Effects of Prison on Crime: Evidence From International Comparisons (with Sarath Sanga)
Cato Papers on Public Policy, Volume 2, 2012

Controlling Crime: Strategies and Tradeoffs (co-edited with Phil Cook and Jens Ludwig), Chicago: University of Chicago Press, 2011.

Scholarship on Competition

Measuring Benchmark Damages in Antitrust Litigation (with Daniel L. Rubinfeld)
Journal of Econometric Methods, Volume 3, January 2014

Scholarship on Finance

Dark Trading at the Midpoint: Pricing Rules, Order Flow, and Price Discovery (with Robert Bartlett)
Accepted, Journal of Law, Finance, and Accounting

How Rigged Are Stock Markets?: Evidence from Microsecond Timestamps (working paper, 2016, with Robert Bartlett)

Shall We Haggle in Pennies at the Speed of Light or in Nickels in the Dark?: How Minimum Price Variation Regulates High Frequency Trading and Dark Liquidity (working paper, 2015, with Robert Bartlett)

Scholarship on Labor Economics

Unmarked? Criminal Record Clearing and Employment Outcomes (with Jeffrey Selbin (lead author) and Joshua Epstein)
Journal of Criminal Law and Criminology, Volume 108, Number 1, 2017 (lead article)

The Effect of Female Education on Fertility and Infant Health: Evidence from School Entry Laws Using Exact Date of Birth (with Heather Royer)
American Economic Review, Volume 101, Number 1, February 2011

Comment on "Free to Punish? The American Dream and the Harsh Treatment of Criminals", by Rafael di Tella and Juan Dubra
Cato Papers on Public Policy, Volume 1, 2011

Dynamic Perspectives on Crime
 in *Handbook of the Economics of Crime*, Chapter 4, Edward Elgar, 2010

The Effect of Court-Ordered Hiring Quotas on the Composition and Quality of Police
American Economic Review, Volume 97, Number 1, March 2007

Using Electoral Cycles in Police Hiring to Estimate the Effect of Police on Crime: Comment
American Economic Review, Volume 92, Number 4, September 2002

Other Scholarship

The Ph.D. Rises in American Law Schools, 1960-2011: What Does It Mean for Legal Education? (with Joy Milligan and James Phillips)
Journal of Legal Education, Volume 65, Number 543, Spring 2016

Following Germany's Lead: Using International Monetary Linkages to Estimate the Effect of Monetary Policy on the Economy (with Julian di Giovanni and Till von Wachter)
Review of Economics and Statistics, Volume 91, Number 2, May 2009

Other Activities

- 2017– Member, Board of Directors, American Law and Economics Association
- 2014– Member, Quantitative Advisory Board, KOR Trading
- 2008– Co-Director (with Phil Cook and Jens Ludwig), *Crime Working Group*, National Bureau of Economic Research
- 2009–2014 Co-Director, *Law and Economics Program*, University of California, Berkeley

Courses Taught

Columbia

- 2017–2018 L6231-002: Corporations (Fall)

Berkeley

- 2016–2017 Law 244.4: Litigation and Statistics (Fall); Law 216: Law and Economics Workshop (Fall); Law 218.6: Law and Economics of Discrimination (Fall)
- 2015–2016 Law 250: Business Associations (Fall); Law 244.4: Litigation and Statistics (Fall); Letters and Science 39D: Race, Policing, and Data Science (Fall)
- 2014–2015 Law 250: Business Associations (Fall); Law 250S: Business Associations (Summer)
- 2013–2014 Law 250S: Business Associations (Summer)
- 2012–2013 Law 250: Business Associations (Fall); Law 250S: Business Associations (Summer); Law 209.3: Introductory Statistics (Fall)
- 2011–2012 Law 250: Business Associations (Fall); Law 250S: Business Associations (Summer); Law 209.3: Introductory Statistics (Fall); Law 251.31: Introduction to Law, Economics, and Business (Spring); Legal Studies 145: Law and Economics I (undergraduate)
- 2010–2011 Law 250: Business Associations (Fall); Law 250S: Business Associations (Summer); Law 216: Law and Economics Workshop (Fall and Spring); Legal Studies 145: Law and Economics I (undergraduate); Law 209.6: Topic in Quantitative Methods (JSP); Econ 250C: Labor Economics (graduate, shared course with 209.6)
- 2009–2010 Law 216: Law and Economics Workshop (Fall and Spring); Law 209.32: Quantitative Methods II (JSP)
- 2008–2009 Legal Studies 145: Law and Economics I (undergraduate); Law 209.3: Quantitative Methods I (JSP); Law 209.32: Quantitative Methods II (JSP)
- 2007–2008 Legal Studies 145: Law and Economics I (undergraduate); Law 209.3: Quantitative Methods I (JSP)

Michigan

Introduction to Quantitative Methods (policy), First Econometrics Field Course (economics), Advanced Economic Theory (policy)

Grants and Fellowships

- 2007–2010 NIH, Constructive Proposals for Dealing With Attrition (with John DiNardo)
- 2009 Committee on Research, Junior Faculty Research Grant, UC Berkeley
- 2006–2009 NIH, The Effect of Female Education on Fertility and Infant Health (with Heather Royer, Grant # R03 HD051713)

- 2006–2011 NSF, New Instrumental Variables Estimates of the Effects of Schooling and Military Service: Empirical Strategies Using Non-Public-Use Data (with Josh Angrist and Stacey Chen)
- 2005 RWJ Foundation Health and Society Scholars Program, Small Grant Program
- 2004 Rackham Interdisciplinary Grant, University of Michigan
- 2004 CLOSUP Grant, University of Michigan
- 2004 National Poverty Center Grant, University of Michigan
- 2002–2003 Chancellor's Dissertation Year Fellowship, UC Berkeley

Presentations

- 2017–2018 Columbia University, School of Law; Georgetown University, School of Law
 - 2016–2017 George Mason University, School of Law; University of Michigan, Economics Department (Summer, Fall); Equities Leaders Summit; University of Zürich, Department of Economics; ETH (Swiss Federal Institute of Technology) Zürich, Law and Economics; Northwestern University, School of Law; Duke University, School of Law; Duke University, Information Initiative
 - 2015–2016 Goldman Sachs; University of California, Berkeley, School of Law; University of Virginia, School of Law; University of California, Irvine; Equal Employment Opportunity Commission; National Bureau of Economic Research, Summer Institute
 - 2014–2015 Duke University; Federal Reserve Bank of New York; Equal Employment Opportunity Commission (EEO-DataNet); American Law and Economics Association (discussant); New York University (NYU / Penn Law and Finance Conference); National Bureau of Economic Research, Summer Institute (discussant)
 - 2013–2014 University of Southern California, School of Law; London School of Economics; Bank of Spain; CEMFI; Carlos III; University of Zaragoza; University of Rotterdam; University of Maastricht; University of Göteborg
 - 2012–2013 University of California, Los Angeles, School of Law
 - 2011–2012 University of Oregon, Department of Economics; University of British Columbia, Department of Economics; Brown University, Department of Economics; University of Rochester, Department of Economics; Cato Institute; National Bureau of Economic Research, Summer Institute; Harvard Law School
 - 2010–2011 Northwestern, School of Law; University of Wisconsin, Department of Economics; Brookings Institution; Cato Institute
 - 2009–2010 University of Chicago, School of Law; Cornell University, School of Law and Department of Economics; University of Michigan, School of Law and Department of Economics; University of Virginia, School of Law, Olin Conference
 - 2008–2009 University of California, Los Angeles, School of Law; University of Arizona, School of Law and Department of Economics; Stanford University, School of Law and Department of Economics; University of Miami, Department of Economics
 - 2007–2008 Northwestern University, School of Law; University of Michigan, Department of Economics; National Bureau of Economic Research, Summer Institute; Florida State University
- Prior to 2007–2008, presentations are at departments of economics, unless otherwise noted*
- 2006–2007 University of Michigan, Program in Survey Methodology; Public Policy Institute of California; Brown University
 - 2005–2006 University of Michigan; University of California, Irvine; University of California, Santa Barbara; University of California, Santa Cruz; California State University, Long Beach; University of Western Ontario; University of Toronto; University of Illinois, Chicago; University of Chicago, Graduate School of Business; APPAM; University of Florida; University of California, Berkeley, School of Law; Princeton University; RAND; Hebrew University (conference in honor of Reuben Gronau); Stanford University, University of Wisconsin, Madison; Northwestern University; Crime and Economics Summer Workshop, University of Maryland

- 2004–2005 Federal Reserve Bank of Chicago; University of Illinois, Urbana-Champaign; University of Michigan, William Davidson Institute; University of Maryland; Urban Institute; American Economics Association Meetings; City University of New York Health Economics Seminar; University of Wisconsin, Madison; Stanford University; University of California, Davis; University of California, Berkeley, Labor Lunch; NBER Summer Institute, Education/Labor Studies
- 2003–2004 University of Michigan; APPAM; NBER Labor Studies Meeting (Fall); Massachusetts Institute of Technology; Harvard University, Kennedy School; University of California, Los Angeles; University of California, San Diego; Columbia University; University of California, Berkeley; NBER Summer Institute, Monetary Policy; NBER Summer Institute, Labor Studies
- 2002–2003 University of California, San Diego; University of California, Los Angeles; RAND Institute; University of Chicago, Graduate School of Business; University of Chicago, Harris School of Public Policy; University of Michigan, Ford School of Public Policy; Columbia University; Dartmouth College; Federal Reserve Bank of New York; Boston University

Last updated: June 16, 2018

Appendix B

Documents Considered by Justin McCrary, Ph.D.

Legal Pleadings

- Opinion and Order, *Floyd et al. v. the City of New York* May 16, 2012
- Plaintiffs' Opposition to Defendants' Joint Motion to Exclude Dwight Steward, Ph D , as an Expert Witness, February 24, 2005
Kelly v. Paschall

Expert Report

- Rebuttal Expert Report of Dwight D Steward, Ph D RE: Bryan Ricchetti, Ph D May 8, 2018

Depositions

- Deposition of Dwight Steward, Ph D June 22, 2018

Academic Literature

- Angrist, Joshua D , and Alan B Krueger, "Empirical Strategies in Labor Economics," Orley C Ashenfelter and David Card (Eds), *Handbook of Labor Economics* , pp 1277–1366 1999
- Card, David, and Jesse Rothstein, "Racial Segregation and the Black-White Test Score Gap," *Journal of Public Economics* , 91(11-12), pp 2158–2184 2007
- Cascio, Elizabeth U , and Ebonya Washington "Valuing the Vote: The Redistribution of Voting Rights and State Funds following the Voting Rights Act of 1965," *Quarterly Journal of Economics* , 129(1), pp 379–433 2014
- Chalfin, Aaron, and Justin McCrary, "Are U S Cities Underpoliced? Theory and Evidence," *Review of Economics and Statistics* , 100(1), pp 167–186 2018
- Chalfin, Aaron, and Justin McCrary, "Criminal Deterrence: A Review of the Literature," *Journal of Economic Literature* , 55(1), pp 5–48 2017
- Chetty, Raj, Nathaniel Hendren, and Lawrence F Katz, "The Effects of Exposure to Better Neighborhoods on Children: New Evidence from the Moving to Opportunity Experiment," *American Economic Review*, 106(4), pp 855–902 2016
- Cutler, David M , and Edward L Glaeser, "Are Ghettos Good or Bad?" *Quarterly Journal of Economics* , 112(3), pp 827–872 1997
- Davidson, Chandler, and Bernard Grofman, (Eds), *Quiet Revolution in the South: The Impact of the Voting Rights Act, 1965-1990* , Princeton University Press, Princeton, NJ 1994
- Fagan, Jeffrey A , et al , "Street Stops and Broken Windows Revisited: The Demography and Logic of Proactive Policing in a Safe and Changing City," Stephen K Rice and Michael D White (Eds) *Race, Ethnicity, and Policing: New and Essential Readings* , New York University Press, New York and London, pp 309–348 2009
- Gelman, Andrew, Jeffrey Fagan, and Alex Kiss, "An Analysis of the New York City Police Department's 'Stop-and-Frisk' Policy in the Context of Claims of Racial Bias," *Journal of American Statistical Association* , 109(479), pp 813–823 2007
- Rougeau, Vincent D , and Keith N Hylton, "Lending Discrimination: Economic Theory, Econometric Evidence, and the Community Reinvestment Act," *The Georgetown Law Journal* , 85(237), pp 237–294 1996
- Rubinfeld, Daniel L , "Reference Guide on Multiple Regression," *Reference Manual on Scientific Evidence* , 3rd Edition, Federal Judicial Center, the National Academies Press, Washington, D C 2011
- Sanga, Sarath, "Does Officer Race Matter?" *American Law and Economics Review* , 16(2), pp 403–432 2014
- Wooldridge, Jeffery M , *Introductory Econometrics: A Modern Approach* , 5th Edition, South-Western Cengage Learning, Mason, Ohio 2012

Public Press/Websites

- "Moving to Opportunity for Fair Housing," available at *U.S. Department of Housing and Urban Development* , <https://www.hud.gov/programdescription/mto>

EXHIBIT 3

**UNITED STATES DISTRICT COURT
FOR THE SOUTHERN DISTRICT OF MISSISSIPPI
JACKSON DIVISION**

LATOYA BROWN; LAWRENCE
BLACKMON; HERBERT ANTHONY
GREEN; KHADAFY MANNING;
QUINNETTA MANNING; MARVIN
MCFIELD; NICHOLAS SINGLETON;
STEVEN SMITH; BESSIE THOMAS; and
BETTY JEAN WILLIAMS TUCKER,
individually and on behalf of a class of all
others similarly situated,

Plaintiffs,

v.

MADISON COUNTY, MISSISSIPPI;
SHERIFF RANDALL S. TUCKER, in his
official capacity; and MADISON COUNTY
SHERIFF'S DEPUTIES JOHN DOES #1
through #6, in their individual capacities,

Defendants.

Civil Action No.

3:17-cv-00347-WHB-LRA

REBUTTAL EXPERT REPORT OF PATRICIA FRONTIERA, Ph.D.

July 2, 2018

Table of Contents

1.	QUALIFICATIONS AND ASSIGNMENT	3
1.1.	Qualifications.....	3
1.2.	Assignment	4
1.3.	Summary of Findings.....	4
2.	ARCGIS IS A WIDELY USED TOOL IN ACADEMIC RESEARCH.....	7
3.	STREET INTERSECTIONS CAN BE RELIABLY GEOCODED	11
3.1.	Street intersection data contain enough location information to be successfully geocoded.....	11
3.2.	Dr. Ricchetti's use of the Match Score is consistent with Standard Geocoding Practice	12
3.3.	Mr. Funderburk's Assessment of Geopositional Accuracy is Flawed.....	15
3.4.	Coordinate Reference System Issues do not significantly impact the analysis of Roadblock locations.....	21
3.5.	The relevance of roadblocks located on the boundary between census tracts can be tested using standard methods	23
4.	CONCLUSION	30

1. QUALIFICATIONS AND ASSIGNMENT

1.1. *Qualifications*

1. I am a geospatial data scientist with the Social Sciences Data Lab (D-Lab) at the University of California Berkeley. The D-Lab provides research support to graduate students, advanced undergraduates, faculty and other scholars on methods and tools for computational data analysis. In my position at the D-Lab I lead our geospatial topic area which entails developing and teaching workshops on a wide variety of topics related to geospatial data, mapping and spatial analysis as well as consulting with individuals and on research projects in this domain. I have been with the D-Lab since August 2014.
2. Geocoding is one of my areas of expertise at the D-Lab. Since 2015 I have developed and taught over 12 workshops on geocoding using the ArcGIS, the Google Maps API, the Census Geocoding API as well as methods for geocoding in the R and Python programming languages. I regularly consult with researchers on geocoding strategies and tools, averaging one such consult per month, many of which extend over multiple visits.
3. In addition to my position at the D-Lab I have taught courses on geospatial data analysis as a lecturer University of California Berkeley for the departments of Landscape Architecture & Environmental Planning, Environmental Science, and Policy Management and the newly formed Division of Data Science. As a lecturer for the Division of Data Science I created one of the first, if not the first, undergraduate introduction to geographic data course using the Python programming language in the U.S.
4. My professional and academic work has involved geographic data and ESRI products such as ArcGIS since 1996 when I joined the staff of the UC Berkeley Center for Environmental Design research as a research programmer. I earned my Ph.D. in Environmental planning from UC Berkeley where my thesis explored the use of generalized coordinate representations in geographic information retrieval.
5. After my Ph.D. and prior to joining the D-Lab, I was a senior GIS technology specialist for the San Francisco Estuary Institute, a non-profit focused on improving the health and resiliency of aquatic habitats in the Bay Area. In this position I

created several web-based mapping tools that incorporated geocoding functionality to map locations by place names and addresses.

6. My CV is attached as Appendix A to this report and includes a detailed list of my professional and academic work including conference presentations and publications.
7. I have never testified as an expert. I am providing my services in this matter at a rate of \$250/hour.

1.2. Assignment

8. I have been asked by counsel for Plaintiffs to review the reports of Mr. Funderburk and Dr. Ricchetti, and comment on Mr. Funderburk's opinions about the location data produced in this case by the Madison County Sheriff's Department and the geocoding done by Dr. Ricchetti.

1.3. Summary of Findings

9. I have reviewed the reports of Dr. Ricchetti and Mr. Funderburk. In this report, I evaluate the geocoding performed in Dr. Ricchetti's initial report, and respond to several of the claims by Mr. Funderburk about this geocoding and its use in Dr. Ricchetti's analysis. I find that Dr. Ricchetti's initial report followed best practices resulting in a high level of overall geocoding quality. Specifically, Dr. Ricchetti geocoded locations with ArcGIS, a widely used geocoding software package, using standard and accepted techniques.
10. I further find that Mr. Funderburk frequently overstates many of his claims. He concludes that Dr. Ricchetti's geocoding is not accurate, precise, or reliable but does not support these conclusions with standard geocoding evaluation practices or statistical analysis. Mr. Funderburk's misstatements appear to stem from (1) a failure to consider the ultimate purpose of Dr. Ricchetti's geocoding, (2) a failure to meet the academic standard of a randomized evaluation, and (3) a lack of familiarity with the academic literature surrounding geocoding best practices.
11. Contrary to what Mr. Funderburk implies in his report, neither a geographer nor a geospatial professional is needed to successfully geocode roadblock locations with ArcGIS. ArcGIS and other software for working with geographic information are used in a wide variety of professions and academic disciplines. On a regular basis, I

teach and consult with epidemiologists, planners, economists, historians, sociologists, political scientists, humanists, linguists, computer scientists, and legal scholars, among others, who successfully use ArcGIS and geocoding in their work without being experts in either. Because of this, I do not agree with Mr. Funderburk's contention that Dr. Ricchetti needed to retain an expert geographer or geospatial professional in order to obtain reliable and accurate geocoded locations from ArcGIS.

12. Mr. Funderburk's claims that street intersections cannot be accurately geocoded are contrary to my own experience and to the numerous academic studies in which these data are accurately geocoded and the resulting locations used in analyses. In particular, this practice is widely used in transportation research and public health research that investigates vehicle and pedestrian accidents.
13. Contrary to Mr. Funderburk's claims, a geocoding match score is a standard metric for evaluating the quality of geocoded locations. Higher thresholds for match scores are associated with an overall higher level of geocoding accuracy and precision. Dr. Ricchetti's analysis used a conservatively high threshold of 90 relative to thresholds used in academic papers.
14. The research literature is clear that geocoding accuracy must be evaluated relative to the application in which it is being applied. Dr. Ricchetti's analysis uses the geocoded output to identify census tracts in which roadblocks are located. Mr. Funderburk's claim that the positional accuracy of Dr. Ricchetti's geocoding is insufficient to identify the census tract in which a roadblock was located is not supported by my review of the data or published academic work.
15. Mr. Funderburk identifies purported flaws in Dr. Ricchetti's analysis that are not in fact flaws and fails to demonstrate how these purported flaws are material to Dr. Ricchetti's analysis. Specifically, most of the purported flaws in geocoding Mr. Funderburk identifies are in fact ostensible errors in the underlying data, not errors in geocoding. Mr. Funderburk also expounds on the need for coordinate reference system alignment but does no analysis to show how this impacts the overall results of Dr. Ricchetti's analysis. I discuss below why this is not an issue in the analysis.
16. Mr. Funderburk claims that roadblocks located in streets that are also census tract boundaries invalidate Dr. Ricchetti's analysis, yet again he offers no analysis to support this. Rather, I confirm the accuracy of Dr. Ricchetti's census tract

boundaries and perform analysis to show that the method Dr. Ricchetti uses to associate roadblocks with census tracts was reliable, and that any incremental error in the assignment of roadblocks on census tract boundaries to specific tracts likely resulted in undercounting number of roadblocks within census tracts with a relatively high black population percentage. Thus, this purported issue in fact makes Dr. Ricchetti's results likely conservative.

2. ARCGIS IS A WIDELY USED TOOL IN ACADEMIC RESEARCH

17. ESRI's ArcGIS is a widely used tool for geocoding data for statistical analysis. Research articles that compare geocoding tools almost always include a review of ArcGIS, or its predecessor ArcView, indicating its prominent use.¹ There are few commercial alternatives that offer the same level of ease of use, input customization, both on-premise and online environments, and high output quality. The Google Geocoding API produces comparable output quality but with the tradeoff that a programming interface is required (no graphical user interface).²
18. Geocoding with ArcGIS is widely used because it is very highly regarded. ESRI is one of the oldest GIS software companies and its business is focused on creating software tools for geographical data, analysis, and mapping. This focus has allowed ESRI many years to progressively refine and improve their products, efforts from which I have benefited greatly over the last 18+ years as these tools evolved from ArcView 3.1 to 10.5.1. In short, ESRI's ArcGIS suite of tools and related data products are the de facto standard for geocoding in academic teaching and research, commanding a dominant share of the commercial market as well.³
19. There is an extensive body of literature on the successful application and evaluation of geocoding by leading scholars in a variety of fields including public health, epidemiology, city and regional planning, transportation, public safety, economics, and sociology, among others. For example, the multi-year Harvard Public Health Disparities Geocoding Project produced a number of articles that demonstrate the effectiveness of geocoding health data and associating it with census tract-level demographic data in order to better understand and improve socio-economic disparities in access to healthcare.⁴ The journal *Spatial and Spatio-temporal*

¹ For example, see Zandbergen, Paul A., "Geocoding Quality and Implications for Spatial Analysis," *Geography Compass*, 3(2), 2009, pp. 647–680.

² Roongpiboonsopit, Duangduen and Hassan A. Karimi, "Comparative Evaluation and Analysis of Online Geocoding Services," *International Journal of Geographical Information Science*, 24(7), 2010, pp. 1081–1100.

³ Duncan, Dustin T., et al., "Evaluation of the Positional Differences Between Two Common Geocoding Methods," *Geospatial Health*, 5(2), 2011, p. 266.

⁴ "The Public Health Disparities Geocoding Project Monograph: Executive Summary," available at Harvard T.H. Chan School of Health, <https://www.hsph.harvard.edu/thegeocodingproject/executive-summary>; Krieger, Nancy et al., "Geocoding and Monitoring of US Socioeconomic Inequalities in Mortality and Cancer Incidence: Does the Choice of Area-based Measure and Geographic Level Matter?," *American Journal of Epidemiology*, 156(5), 2002, pp. 471–482.; Krieger, Nancy, "A Century of Census Tracts: Health & the Body Politic (1906–2006)," *Journal of Urban Health: Bulletin of the New York Academy of Medicine*, 83(3), 2006, pp. 355–361.

Epidemiology dedicated a special issue to the topic of geocoding and health research.⁵ Additionally, Ratcliffe evaluates the effectiveness of geocoding for crime mapping.⁶ More germane to this report, Levine & Kim, Dutta et al., Bigham et al., Park, and Qin all describe effective methods for geocoding intersections where motor vehicle crashes occur.⁷

20. As I describe below, most of the geocoding critiques of Dr. Ricchetti's analysis identified by Mr. Funderburk stem from incomplete information in the data provided by MCSD rather than from geocoding errors. As I discuss below, this case also presents the issue of the existence of roadblocks on boundaries of census tracts. This is, however, not a geocoding problem and rather a geographical problem that can be assessed through a variety of robustness analyses.
21. Geocoding is the process of determining the geographic coordinates for a named place, street address, postal code, or any other non-geometric representation of a geographic location. I will limit this discussion to street address and intersection geocoding. The process is straight-forward and consistent across geocoding software. First, you undertake several steps to "clean" or standardize the data you want to geocode. This entails (1) putting your records in the file format required by your geocoding software, with either all address components in the same column or in separate columns, e.g. *street name, city, state, zip*; (2) standardizing the text format of your records, e.g. with consistent capitalization, abbreviations for streets (Ave for Avenue), and conventions such as "&" or "AND" to denote an intersection; and (3) adding as much information as possible to all records such as the city, county, state, and zip code.
22. A review of the data provided by Dr. Ricchetti to Mr. Funderburk in the table of *Compiled Unique Roadblocks* shows how this was done for these roadblock data.⁸ I

⁵ *Spatial and Spatio-temporal Epidemiology*, 3(2), 2012, pp. 93–112.

⁶ Ratcliffe, Jerry H., "Geocoding Crime and a First Estimate of a Minimum Acceptable Hit Rate," *International Journal of Geographical Information Science*, 18(1), pp. 61–72.

⁷ Levine, Ned and Karl E. Kim, "The Location of Motor Vehicle Crashes in Honolulu: A Methodology for Geocoding Intersections," *Computational, Environmental and Urban Systems*, 22(6), 1998, pp. 557–576; Dutta, Arup, et al., "System for Digitizing Information on Wisconsin's Crash Locations," *Journal of the Transportation Research Board*, (19), 2007, pp. 256–264; Qin, Xiao, et al., "Intelligent Geocoding System to Locate Traffic Crashes," *Accident Analysis and Prevention*, 50, 2013, pp. 1034–1041; Bigham, John M., et al., "Geocoding Police Collision Report Data from California: A Comprehensive Approach," *International Journal of Health Geographics*, 8(72), 2009, pp. 1–10; Park, Shin H., et al., "Geocoding Vehicle Collisions on Korean Expressways Based on Postmile Referencing," *Journal of Civil Engineering*, 15(8), 2011, pp. 1435–1441.

⁸ Report of William R. Funderburk, May, 8, 2018 ("Funderburk Report"), Appendix D.

include this table in my report as Appendix C. If you compare the values in the *original_address* column with those in the *clean_address* column you see that the street names have been formatted in upper case, with “AND” as the intersection delimiter, the county and state has been added to each address, and address components are comma delimited. Contrary to what Mr. Funderburk states, the applied cleaning process is transparent and consistent with standard practices.

23. Once the input data are “clean” they can be geocoded. Geocoding requires three key components. The first is the input data. The second is a reference database against which input locations will be compared for candidate matches. The third is the geocoding software engine that ingests the input data and uses algorithms and rules to search the reference database for matches.
24. The quality of the reference database is directly related to the output quality.⁹ A reference database that is comprehensive in geographic coverage, is up-to-date, and contains a high level of spatial and attribute detail and accuracy will provide better results. Moreover, geocoding reference databases are increasingly adding multiple spatial representations against which input data can be matched including parcel polygons and center points, street centerlines, street intersection tables, and named points of interest.¹⁰
25. Available ArcGIS reference databases include the online World Geocoding Service, the ArcGIS Business Analyst Geocoding data, and Streetmap Premium data for ArcGIS. The latter two databases are updated annually while the online World Geocoding Service is updated more frequently. In my professional opinion the World Geocoding Service reference database is one of the best available for locations in the United States, along with the Google Geocoding API reference database.
26. ArcGIS provides a number of software tools that can geocode input data with the World Geocoding Service reference database. One approach is to use the ArcGIS Desktop software, locally installed on your computer, which provides a graphical

⁹ Goldberg, Daniel W.; John P. Wilson and Craig A. Knoblock, “From Text to Geographic Coordinates: The Current State of Geocoding,” *Journal of the Urban and Regional Information Systems Association*, 19(1), 2007, pp. 33–46; Zandbergen, Paul A., “Geocoding Quality and Implications for Spatial Analysis,” *Geography Compass*, 3(2), 2009, pp. 647–680.

¹⁰ Zandbergen, Paul A., “A Comparison of Address Point, Parcel and Street Geocoding Techniques,” *Computers, Environment and Urban Systems*, 32(3), 2008, p. 218.

user interface to make requests to the remote service. Another approach is to write a script, or short software program, that uses an API (or application programming interface) to submit your records to be geocoded to the online ArcGIS World Geocoding Service. My review of Dr. Ricchetti's Python geocoding script shows that this latter method was used to geocode the roadblock locations with the ArcGIS World Geocoding Service.

27. In short, contrary to what Mr. Funderburk has suggested, Dr. Ricchetti used standard practices to geocode roadblock locations using one of the best, if not the best, available geocoding tools — the ArcGIS World Geocoding Service.

3. STREET INTERSECTIONS CAN BE RELIABLY GEOCODED

28. Mr. Funderburk identifies several potential areas of geocoding imprecisions in Dr. Ricchetti's analysis. Mr. Funderburk concludes that "it does not appear that the address information kept by MCSD contains enough information to perform geographic analysis such as geocoding."¹¹ Based on my professional experience, the types of imprecision Mr. Funderburk identifies are common in administrative data and do not render geocoding and statistical analysis of the data unreliable.

3.1. *Street intersection data contain enough location information to be successfully geocoded*

29. Mr. Funderburk suggests repeatedly that street intersections cannot be accurately geocoded and that this is a significant problem for Dr. Ricchetti, because 93.4% of the roadblock locations in this case are recorded at intersections rather than at exact addresses.¹² He states:¹³

"To geocode properly, the software needs to compute the geometry of the desired point information. If we are using hard street addresses and have performed our pre-processing calibration, it is a relatively easy process. However, using intersection-only information introduces a variety of errors in geopositional accuracy and precision."

30. I strongly disagree with these assertions. As I explain above, street intersections can be and are regularly geocoded with acceptable levels of accuracy and precision.¹⁴ Street intersection geocoding has some of the same challenges as street address geocoding such as the need for high quality geocoding software and a high quality reference database, both of which are provided by ArcGIS. Both require sufficient input information to determine a location. For a street address this includes a street number, street name, and containing locality (e.g., city, zip code, county, state, country) while a street intersection needs only the names of the two streets and the

¹¹ Funderburk Report, ¶ 46.

¹² Funderburk Report, ¶ 45.

¹³ Funderburk Report, ¶ 49.

¹⁴ Levine, Ned and Karl E. Kim, "The Location of Motor Vehicle Crashes in Honolulu: A Methodology for Geocoding Intersections," *Computational, Environmental and Urban Systems*, 22(6), 1998, pp. 557–576; Dutta, Arup, et al., "System for Digitizing Information on Wisconsin's Crash Locations," *Journal of the Transportation Research Board*, (19), 2007, pp. 256–264; Qin, Xiao, et al., "Intelligent Geocoding System to Locate Traffic Crashes," *Accident Analysis and Prevention*, 50, 2013, pp. 1034–1041; Bigham, John M., et al., "Geocoding Police Collision Report Data from California: A Comprehensive Approach," *International Journal of Health Geographics*, 8(72), 2009, pp. 1–10; Park, Shin H., et al., "Geocoding Vehicle Collisions on Korean Expressways Based on Postmile Referencing," *Journal of Civil Engineering*, 15(8), 2011, pp. 1435–1441.

locality. One challenge unique to street intersection geocoding is that two streets can intersect in more than one location within the same locality, for example where a divided road intersects with another street. These cases can be easily identified, reviewed, and, if needed, resolved with the ArcGIS geocoder which will return a match type of *street intersection* with a status of *tied* for these locations.

31. Based on my experience I would argue that street intersections can be geocoded with a higher level of positional accuracy than street addresses, particularly when street address geocoding is based on interpolation, a common practice to compute coordinates for a street address based on the relative position of a street number with a street address range. For example, 50 Main St would be interpolated to the middle of a block with addresses ranging from 0 to 100. However, numerous studies have shown that linear interpolation can be quite inaccurate in areas with curved streets, cul-de-sacs, and irregularly shaped or sized parcels.¹⁵

3.2. Dr. Ricchetti's use of the Match Score is consistent with Standard Geocoding Practice

32. In his report Mr. Funderburk asserts that Dr. Ricchetti did not adequately assess the quality of the geocoding output.¹⁶ He also criticizes Dr. Ricchetti's use of the match score as a measure of geocoding quality and accuracy.¹⁷ I comment on both of these below.
33. Geocoding quality is most commonly evaluated in terms of match rate and positional accuracy.¹⁸ Match rate refers to the percent of total input records for which the geocoder found a successful match. ArcGIS, and other geocoding software, will return a match status of matched, tied, or unmatched for each location input to the geocoder to indicate whether or not the software was able to find a match in the reference database.

¹⁵ For example, see Goldberg, Daniel W., John P. Wilson, and Craig A. Knoblock, "From Text to Geographic Coordinates: The Current State of Geocoding," *Journal of the Urban and Regional Information Systems Association*, 19(1), 2007, pp. 33–46.

¹⁶ Funderburk Report, ¶¶ 17, 32, 60.

¹⁷ Funderburk Report, ¶¶ 67–69.

¹⁸ Abe, Toshi, and David Stinchcomb, "Geocoding Practices in Cancer Registries," Gerard Rushton et al., (Eds.), *Geocoding Health Data: The Use of Geographic Codes in Cancer Prevention and Control, Research and Practice*, CRC Press, Boca Raton, Florida, 2008, pp. 111–125; Zandbergen, Paul A., "Geocoding Quality and Implications for Spatial Analysis," *Geography Compass*, 3(2), 2009, p. 652.

34. A match score threshold is then commonly used as an indicator of a successful match. According to the documentation for the ArcGIS World Geocoding Service the match score is:¹⁹

“A number from 1–100 indicating the degree to which the input tokens in a geocoding request match the address components in a candidate record. A score of 100 represents a perfect match, while lower scores represent decreasing match accuracy. Score is always returned by default.”

35. The match score is a measure of a degree to which an input address was matched to data in the reference database. The higher the score the greater the degree to which the values match.
36. Schootman states in a journal article specifically evaluating geocoding quality that addresses “with a match score of 75 or more were considered a good match.”²⁰ Yang discusses setting a minimum match score to 80 to improve geocoding results.²¹ Dr. Ricchetti conservatively requires a match score of at least 90.²²
37. Positional accuracy refers to the distance between the geocoded location and the real location.²³ For example, if the geocoded point represents a street address then the shortest distance between the point and the boundary of the property would be the positional accuracy.
38. The level of positional accuracy deemed acceptable varies depending on the specific application.²⁴ For example, in a study of vehicle collisions, Bigham defines

¹⁹ “Service Output,” available at *ArcGIS for Developers*, <https://developers.arcgis.com/rest/geocode/api-reference/geocoding-service-output.htm>.

²⁰ Schootman, Mario, et al., “Positional Accuracy and Geographic Bias of Four Methods of Geocoding in Epidemiologic Research,” *Annals of Epidemiology*, 17(6), 2007, pp. 464–470.

²¹ Yang, Duck-Hye, et al., “Improving Geocoding Practices: Evaluation of Geocoding Tools,” *Journal of Medical Systems*, 28(4), 2004, pp. 361–370.

²² Deposition of Bryan Ricchetti, Ph.D., April 6, 2018 (“Ricchetti Deposition”), p. 168:4–10.

²³ Zandbergen, Paul A., “Geocoding Quality and Implications for Spatial Analysis,” *Geography Compass*, 3(2), 2009, p. 652.

²⁴ Zandbergen, Paul A., “Geocoding Quality and Implications for Spatial Analysis,” *Geography Compass*, 3(2), 2009, pp. 663–666.

positionally accurate geocoding as any geocoded point within 50 feet of the real world location as depicted on Google Earth Pro imagery.²⁵

39. The match score is also used as an indicator of positional accuracy.²⁶ Duncan reports that only “geocoded addresses with the highest positional accuracy (as defined by a match score of ≥ 80)” were included in his study.²⁷ According to Zandbergen, “lowering the minimum match score results in a decrease in accuracy and therefore geocoding quality,” which implies that the inverse is true – raising the minimum match score improves geocoding accuracy and quality.²⁸
40. Other measures of geocoding quality include reliability and precision. Reliability is primarily a qualitative measure of the degree of confidence in the geocoding results based on the reputability of the software vendor and the geocoding reference database.²⁹ As discussed previously, ArcGIS geocoding software and reference databases are highly regarded and widely used.
41. Geocoding precision is a measure of the variance in positional accuracy. While positional accuracy is quantified as the measured distance between geocoded points and real locations, precision refers to the difference between those distances and the average distance for the data set as a whole. If match score is used as an indicator of positional accuracy, then variation in match scores can be used to evaluate precision. Moreover, to the extent that a high minimum match score increases geocoding accuracy it would also likely increase precision.
42. In short, contrary to Mr. Funderburk’s claims, Dr. Ricchetti did evaluate the overall quality of the geocoding output. His evaluation was based on the geocoding match

²⁵ Bigham, John M., et al., “Geocoding Police Collision Report Data from California: A Comprehensive Approach,” *International Journal of Health Geographics*, 8(72), 2009, pp. 1–10.

²⁶ Goldberg, Daniel W., “A Geocoding Best Practices Guide,” *The North American Association of Central Cancer Registries*, 2008, p. 98.

²⁷ Duncan, Dustin T., et al., “Evaluation of the Positional Difference Between Two Common Geocoding Methods,” *Geospatial Health*, 5(2), 2011, p. 272.

²⁸ Zandbergen, Paul A., “A Comparison of Address Point, Parcel and Street Geocoding Techniques,” *Computers, Environment and Urban Systems*, 32(3), 2008, p. 218.

²⁹ Goldberg, Daniel W., “A Geocoding Best Practices Guide,” *The North American Association of Central Cancer Registries*, 2008, p. 98.

rate and match score, both of which are standard metrics of overall geocoding. The use of the match score in Dr. Ricchetti's report is consistent with standard practice.

3.3. Mr. Funderburk's Assessment of Geopositional Accuracy is Flawed

43. In contrast, in his report Mr. Funderburk does not use standard geocoding practices to evaluate the geocoding results used in Dr. Ricchetti's study. Note, Mr. Funderburk uses the term "geopositional accuracy" in his report whereas I use the term "positional accuracy" to be consistent with the geocoding literature.
44. In his report, Mr. Funderburk argues that the use of a high match score is not an indicator of geocoding quality.³⁰ He supports this claim by overlaying 25,335 geocoded points from Dr. Ricchetti's analysis with a match score greater than or equal to 90 onto a map of the continental United States.³¹ Because this map displays geocoded points that are located outside of Madison County, Mr. Funderburk concludes that Dr. Ricchetti's geocoding shows extreme errors and is evidence of improper geocoding.³² However, Mr. Funderburk does not quantify those errors in order to substantiate his conclusion.
45. In my analysis of those points, only 204 of 25,335 points, or 0.8%, were located outside of Madison County. In my professional opinion, that percentage is an indicator of a very high level of geocoding quality, consistent with Dr. Ricchetti's use of the match score.
46. Separately from his critique of data points with a match score above 90, Mr. Funderburk presents an "incomplete" (by his own admission)³³ and statistically biased assessment of the positional accuracy of the geocoded roadblock locations in Dr. Ricchetti's report. From this, he concludes without foundation that there are "countless erroneously geocoded locations."³⁴ His assessment is based on a review of a small subset of the geocoded locations that he undertook with Deputy Rylon

³⁰ Funderburk Report, ¶¶ 66–70.

³¹ Funderburk Report, Figure 4.

³² Funderburk Report, ¶¶ 69–70.

³³ Funderburk Report, ¶ 48.

³⁴ Funderburk Report, ¶ 16.

Thompson. Mr. Funderburk claims that this review employed a method called “ground truthing.”³⁵

47. First, I will review the method of ground truthing as it is applied to the evaluation of positional accuracy in geocoding. Then I will describe how Mr. Funderburk did not adequately employ this method and therefore cannot assess the overall positional accuracy of Dr. Ricchetti’s geocoding.
48. Ground truthing is a widely used method for evaluating the accuracy and precision of geocoded results.³⁶ In geocoding applications, the method refers to the process of comparing geocoded point locations to the location of the real world features they represent. Coordinates for the real world feature are obtained by (1) physically visiting the site and using a GPS; (2) reviewing the site on high-resolution imagery such as Google Maps or Google Earth satellite imagery; or less typically (3) from a database of known coordinate locations.
49. Ground truthing requires that a statistically random sample of the geocoded points be selected for review.³⁷ Random in the statistical sense means that any observation has the same chance of being selected for review. Random sample sizes discussed in the geocoding literature vary depending on the goals of the analysis at hand and typically range from 1%³⁸ to 5%.³⁹
50. For each selected point the Euclidean distance between the geocoded and real world coordinates is measured. The distance would then be recorded for each pair of points. The overall positional accuracy of the geocoding would then be determined based on the average or median distances between the geocoded points reviewed and the location in the real world.
51. It is important to note that points are simplistic representations of complex, real world geographic features such as a parcel boundaries, structures, street

³⁵ Funderburk Report, ¶¶ 12, 46–48.

³⁶ Goldberg, Daniel W., “A Geocoding Best Practices Guide,” *The North American Association of Central Cancer Registries*, 2008, p. 104.

³⁷ For example, see Zhan, F.B. et al., “Match Rate and Positional Accuracy for Two Geocoding Methods for Epidemiologic Research,” *Annals of Epidemiology*, 16(11), 2006, p. 845.

³⁸ Qin, Xiao, et al., “Intelligent Geocoding System to Locate Traffic Crashes,” *Accident Analysis and Prevention*, 50, 2013, p. 1039.

³⁹ Duncan, Dustin T. et al., “Evaluation of the Positional Difference Between Two Common Geocoding Methods,” *Geospatial Health*, 5(2), 2011, p. 267.

intersections, and roadblocks, all of which have features such as size, shape, and orientation that cannot be captured by a point. Given this inherent generalization, positional accuracy is evaluated relative to a point location *within* or *near* the real world geographic feature it represents, for example the center point of a parcel street intersection. Therefore, the process of evaluating positional accuracy requires the documentation of this evaluative criteria.

52. Moreover, because a point is a simplistic representation of a real world geographic feature, ground truthing and accuracy assessment require knowledge of the real world feature under study in order to identify its location on a map or in the field. In this case that would be a person with first-hand knowledge of the location of the roadblocks.
53. The ground truthing analysis as conducted by Mr. Funderburk and Deputy Thomson was flawed for at least two reasons. First, Mr. Funderburk did not review with Deputy Thompson a random sample of the geocoded locations. Second, Mr. Funderburk compared locations geocoded by Dr. Ricchetti to the locations where Deputy Thompson believed the roadblocks physically existed, not to the physical locations on the ground representing the addresses in the *Compiled Unique Roadblocks*. Any discrepancy in Dr. Ricchetti's analyses of this type would be due to imprecise address recording in the *Compiled Unique Roadblocks* by the sheriff's department, not due to geocoding errors. Therefore, whatever the results of his analysis, they cannot be used to draw conclusions about either the positional accuracy or overall quality of the geocoding results.
54. Moreover, I would argue that there is statistical bias in the points that were selected for review.⁴⁰ I say this because a visual review of a map of the geocoded locations will naturally draw one's eyes to the errors, be they few or many, rather than the correct locations. We saw that to be the case in Mr. Funderburk's use of Figure 4 in his report, which I discussed previously.
55. Mr. Funderburk did not define and use a consistent evaluative criteria for positional accuracy. He did not state what constituted an accurately located roadblock, e.g. within 10 meters of the center of the intersection in which it was located. Additionally, Mr. Funderburk did not measure the distance between each of the

⁴⁰ Deposition of William R. Funderburk, June 20, 2018 ("Funderburk Deposition"), pp. 42:24-44:14.

reviewed geocoded points and the locations of the roadblocks that they represent and use those distances to compute an overall metric of positional accuracy.

56. Mr. Funderburk's report implies that Deputy Thompson is familiar with the location of the roadblocks under study and thus provides the local knowledge needed to ground truth geocoded locations.⁴¹ However, he did not confirm that Deputy Thompson was in fact present at all of the roadblocks that they reviewed together or take any other steps to verify the accuracy of Deputy Thompson's recollections.⁴² Therefore, I cannot tell if Deputy Thompson indeed had the local knowledge needed to ground truth the roadblock locations.
57. Additionally, it is clear that Deputy Thompson brought to Mr. Funderburk's review process additional knowledge about roadblock locations that was not included in the information provided as the input to the geocoding software for some of the roadblocks. For example, when describing his Exhibit 1, Mr. Funderburk states "Point No. 18 should be 0.21 miles north on Harbor Drive". The location listed for point 18 that was used to geocode is "HARBOR AND LAKE HARBOR, MADISON COUNTY, MS".⁴³ The geocoded point is shown below on a screen shot of Mr. Funderburk's Exhibit 1 as a green circle at that very intersection, indicative of an accurate geocoding result, where I use accurate to mean within the intersection.

⁴¹ Funderburk Report, ¶ 46.

⁴² Funderburk Deposition, p. 39:6–12. ("Q. When you interviewed Deputy Thompson, did he confirm to you that he had been present at each of the roadblocks that had been plotted in Dr. Ricchetti's report? A. He was present at the roadblocks that are in my exhibits. I can't attest to if he was present at every roadblock in Dr. Ricchetti's report.")

⁴³ Funderburk Report, ¶ 48, Appendix D.

EXHIBIT 1

Replication of Funderburk Exhibit 1



Source: Funderburk Report

Note: From Funderburk Exhibit 1. Image depicts the geocoded location of Roadblock Point 18 (green circle) and the roadblock's "actual" location (X)

58. Yet, Mr. Funderburk presents this as an example of an incorrectly geocoded location because Deputy Thompson states that the “real” location of the roadblock was at the intersection of W. Ramp Rd. and Harbor Dr.⁴⁴ If that were to be true then this is not a geocoding error but rather an error in the underlying data produced in this case – i.e., whoever at the sheriff’s department was responsible for reporting or recording the location of the roadblock did so incorrectly or imprecisely. Data

⁴⁴ Funderburk Report, ¶ 48, Exhibit 1.

recording errors are present in most geocoding input data and do not invalidate the use of such databases.

59. I reviewed the point locations discussed by Mr. Funderburk in Exhibits 1–11 of his report.⁴⁵ My evaluation is shown in my Exhibit 2 below. Ten of the 22 points he presents as evidence of geocoding errors or incorrect census tract assignments are of the nature described above – a discrepancy between the location listed in the table and what Deputy Thompson claimed was the true location of the roadblock. Four are data input errors. Three do not include sufficient address information. Four concern the assignment of roadblocks to census tracts, which I discuss in more detail below in Section 3.5. Only one point could be considered a geocoding positional accuracy error.

EXHIBIT 2

Taxonomy of Errors Asserted for the 22 Points Reviewed by Mr. Funderburk and Claimed to Demonstrate Inaccurate Geocoding, From Funderburk Report, Paragraph 48 and Corresponding Exhibits 1-11

Type of Error Asserted	Description	Point Numbers	Number of points
Bad Data Input	Deputy Thompson's location for the roadblock differs from that listed in the table of Compiled Unique Roadblocks	18, 53, 141, 215, 14, 203, 98, 129, 151, 161	10
Bad Data Input	Typos, abbreviations, or incorrect data input	77, 244, 12, 193	4
Insufficient Address Information	Data input lacked a street address or intersection	159, 287, 3	3
Boundary	Census tract boundary assignment discussed	344, 51, 11, 67	4
Low positional accuracy	Geocoded point evaluated as too far from actual location	100	1

⁴⁵ Funderburk Report, ¶ 48, Exhibit 1–11.

60. Mr. Funderburk bases his assessment of positional accuracy on the assumption that Deputy Thompson's assertions regarding the roadblock locations, and not the addresses and street intersections listed for each roadblock in the table of *Compiled Unique Roadblocks*, identifies their true location. Even if Deputy Thompson's recollection is correct that actual roadblock locations differ from the table of *Compiled Unique Roadblocks* for the limited sample of observations he considered, which I cannot assess, these findings would not necessarily be representative of the data set as a whole because the locations were not selected randomly.
61. It is my professional opinion, based on the above discussion, that Mr. Funderburk's ground truthing process was not performed in accordance with geocoding standard practices. His sample was not random, his process was not documented nor consistently applied, and his knowledge of the true location of roadblocks was based on his interview with Deputy Thompson which was not substantiated. Further, the purported geocoding errors he identifies are, in fact, not geocoding errors. They are either data errors or reliably geocoded roadblocks located on or near census tract boundaries (which I discuss in detail in Section 3.5). Thus, his analysis does not support his conclusions that Dr. Ricchetti's geocoding contains "a variety of errors in geopositional accuracy and precision."⁴⁶

3.4. Coordinate Reference System Issues do not significantly impact the analysis of Roadblock locations

62. In section 4.4 of his report, Mr. Funderburk asserts that issues related to coordinate reference systems undermine the quality and validity of Dr. Ricchetti's analysis. I find this to be untrue and discuss my reasoning below.
63. Geographic coordinates expressed as longitude and latitude can be identical and yet reference two different physical real world locations if they are referenced to different datums. There are currently two families of datums in widespread use for geographic locations in the United States. These are the North American Datum of 1983 (NAD83) and the World Geodetic System of 1984 (WGS84). The ArcGIS World Geocoding Service, which was used by Dr. Ricchetti, returns geocoded

⁴⁶ Funderburk Report, ¶ 49.

results in the WGS84 datum.⁴⁷ Census tract boundary spatial data files, called TIGER Files, are distributed with geographic coordinates referenced to NAD83.

64. For the continental United States, the positional difference in WGS84 and NAD83 coordinates varies from one meter to four meters depending on the version of the datums used. For applications that require less than three meter accuracy, transformations between these two datums are not recommended as those transformations can introduce additional error.⁴⁸ In other words, it is common practice to treat WGS84 and NAD83 geographic coordinates as though they were referenced to the same coordinate reference system.
65. Dr. Ricchetti's analysis does not require sub-three meter positional accuracy to identify the census tract in which a roadblock represented by a point resides. This is because census tract boundaries do not have sub-three meter positional accuracy. In fact the US Census does not publish the positional accuracy of census tract geographic data.⁴⁹ We can also safely assume that the geocoded roadblocks do not have sub-three meter positional accuracy since the street intersections and street addresses against which they are geocoded are typically more than three meters wide in one dimension.
66. WGS84 and NAD83 are both three-dimensional geographic coordinate systems. Geographic coordinates are often transformed to a two-dimensional projected coordinate system before any spatial analysis is undertaken. This transformation is required if the spatial analysis includes distance-based measurements or if the study area is global or near the North Pole or South Pole.
67. Dr. Ricchetti's spatial analysis did not involve distance-based measurements. His analysis only considered the topological spatial relationships between census tract polygons and roadblocks.

⁴⁷ "Service Output," available at *ArcGIS for Developers*, <https://developers.arcgis.com/rest/geocode/api-reference/geocoding-service-output.htm>.

⁴⁸ Fromhertz, Pamela, "Datums and Tools to Connect Geospatial Data Accurately," *National Oceanic and Atmospheric Administration*, June 20, 2012, available at https://www.ngs.noaa.gov/web/science_edu/presentations_library/files/usgs_css_brownbag20june2012final.pdf.

⁴⁹ "Positional Accuracy of TIGER/Line Data," available at *U.S. Census Bureau*, https://www.census.gov/geo/landview/lv6help/pos_acc.html.

68. Based on the above, it is my professional opinion that coordinate reference system differences between the NAD83 census tract data and the WGS84 geocoded roadblock points did not play a significant role in Dr. Ricchetti's analysis.

3.5. *The relevance of roadblocks located on the boundary between census tracts can be tested using standard methods*

69. Mr. Funderburk incorrectly states that, because 23% of the roadblock locations are located on census tract boundaries, any analysis based on the assignment of these roadblocks to a specific census tract should be rendered invalid.⁵⁰ Below, I will show why this claim is incorrect.

70. Data collected within and aggregated to census tracts are widely used in research to assess the socio-economic characteristics of populations within a study area. The *Harvard Public Health Disparities Geocoding Project* is a multi-year research effort that in numerous publications describes the effective use of associating data collected at geocoded locations with census tract data to assess disparities in access to health care.⁵¹ According to project director Dr. Nancy Krieger:⁵²

“Census tracts not only provide a stable geographic unit for estimating the number and characteristics of the people and housing units located within them, but they have also expanded scientific understanding of the impact of context on the social patterning of the public's well-being, with obvious policy relevance.”

71. Geocoded locations are most commonly associated with census tract data through a process known as “point-in-polygon” overlay.⁵³ This method entails locating geocoded points and census tract boundaries within the same coordinate space (i.e. coordinate reference system). If numerous points (for example, roadblocks) fall within a region (such as a census tract), the data for the region can be matched to

⁵⁰ Funderburk Report, ¶ 58.

⁵¹ For a general summary, see “The Public Health Disparities Geocoding Project,” available at Harvard T.H. Chan School of Public Health, <https://www.hsph.harvard.edu/thegeocodingproject>.

⁵² Krieger, Nancy, “A Century of Census Tracts: Health & the Body Politic (1906–2006),” *Journal of Urban Health: Bulletin of the New York Academy of Medicine*, 83(3), 2006, pp. 355–361.

⁵³ Schootman, Mario, et al., “Positional Accuracy and Geographic Bias of Four Methods of Geocoding in Epidemiologic Research,” *Annals of Epidemiology*, 17(6), 2007, p. 465.

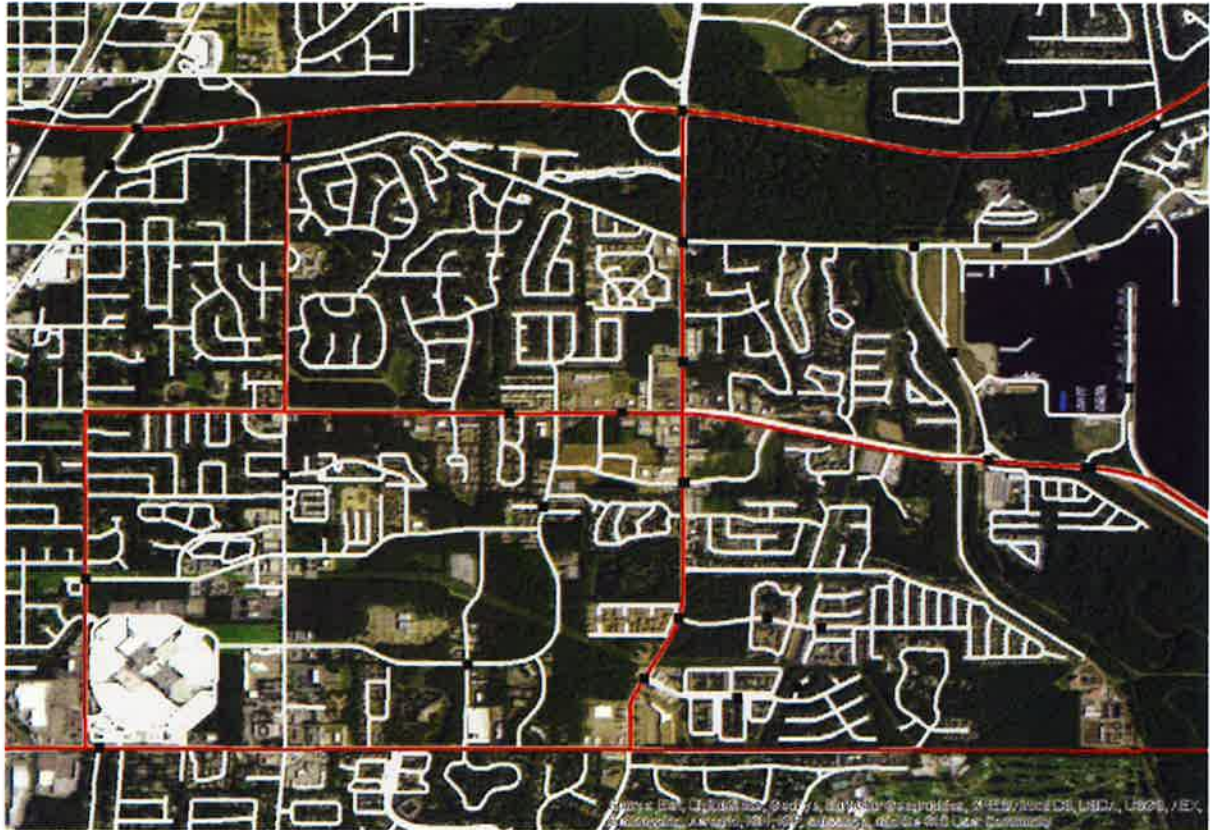
the total number of points. This approach was used by Dr. Ricchetti to count the number of roadblocks within each census tract.

72. There are a number of articles that discuss the challenges of using point-in-polygon overlay to associate census tract data with geocoded points.⁵⁴ There are two key factors: (1) the quality of geocoded locations and (2) the correct assignment of points to census tract polygons. As I have already discussed (1), I focus on (2) below.
73. A key determinant of correct assignment is one of alignment – whether the spatial accuracy of the census tract boundary data supports the accurate identification of points that fall within those tracts. One method to assess this is to display the census tract data on top of aerial imagery and street network data and review the alignment of census boundaries with the street network and other linear features. This will reveal if there are major discrepancies.
74. I undertook this visual review in ArcGIS 10.5.1 using the ESRI Streets base layer and the Business Analyst 2017 geocoding data streets layer. I zoomed in and followed the census tract boundaries. I carefully examined the census boundaries depicted in Exhibit 2 of Dr. Ricchetti's report that delineate adjacent tracts characterized by a higher and lower black population percentage. Throughout the county I viewed a high degree of concordance between the tract boundaries and the street and water features. A map depicting this alignment is shown below.

⁵⁴ Schootman, Mario, et al., "Positional Accuracy and Geographic Bias of Four Methods of Geocoding in Epidemiologic Research," *Annals of Epidemiology*, 17(6), 2007, pp. 464–470; Goldberg, Daniel W., John P. Wilson and Craig A. Knoblock, "From Text to Geographic Coordinates: The Current State of Geocoding," *Journal of the Urban and Regional Information Systems Association*, 19(1), 2007, pp. 33–46; Zandbergen, Paul A., "Geocoding Quality and Implications for Spatial Analysis," *Geography Compass*, 3(2), 2009, pp. 647–680.

EXHIBIT 3

Map Showing the Alignment of Census Tract Boundaries, Major Streets and Streams, and Roadblock Locations within Madison County.



Source: Census TIGER Line Tract boundary data for Madison County, 2015; ArcGIS Business Analyst.

75. Based on this visual analysis and my professional experience, I conclude (1) that the census tracts align well with the ArcGIS street network and (2) census tract – street alignment issues would not result in roadblock points being assigned to incorrect census tracts unless those points were near a census tract boundary. As shown in the map above, and as reported by Mr. Funderburk, certain roadblock locations are near or along census tract boundaries. This is not an error. It is a

product of the fact that (1) the roadblocks are located on streets and (2) street centerlines are used to form census tract boundaries.⁵⁵

76. Separate from the issue of tract boundary accuracy, Mr. Funderburk claims that the existence of some roadblocks close to the boundary of two or more tracts renders the analysis invalid.⁵⁶ As I explain below, the fact that roadblocks occur in streets that are also census tract boundaries does not render those roadblocks invalid for Dr. Ricchetti's analysis. However, the co-occurrence raises the following questions: (1) how many roadblocks are located on census tract boundaries? (2) how were these roadblocks assigned to census tracts in Dr. Ricchetti's analysis? and (3) what impact did his assignment of these roadblocks have on his analysis? I address these questions below in a geospatial analysis of the data.
77. First, I used ArcGIS 10.5.1 to transform the census tract boundary data and the geocoded point data, listed in the *Compiled Unique Roadblocks* table, to the Mississippi Transverse Mercator NAD83 projection (EPSG:3814). This is the projected coordinate reference system used by MARIS: the Mississippi Automated Resource Information System, a governmental organization tasked with coordinating geographic information data sets in the state.⁵⁷ This was done in order to (1) put all data in the same coordinate reference frame and (2) put all data in a projected (Euclidean) coordinate reference frame that supports distance-based queries and calculations.
78. I then converted the Madison County census tract polygon data to line data using the ArcGIS *Polygon-to-Line* tool. Next, I used the ArcGIS *Select-by-Location* tool to identify all roadblock points located on census tract boundary lines. This operation returned zero results – in other words, none of the roadblock points spatially intersect census tract boundaries, which is consistent with Dr. Ricchetti's analysis.
79. This result is not surprising. Census tract data and reference databases used to geocode locations are created by different organizations using different software at different times with different methods. Therefore, point representations of

⁵⁵ "2017 TIGER/Line Shapefiles Technical Documentation," available at *U.S. Census Bureau*, https://www2.census.gov/geo/pdfs/maps-data/data/tiger/tgrshp2017/TGRSHP2017_TechDoc_Ch1.pdf.

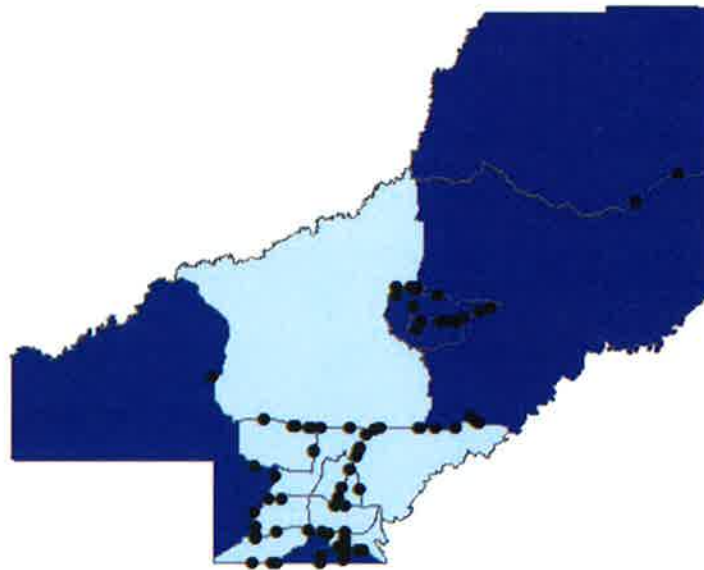
⁵⁶ Funderburk Report, ¶ 58.

⁵⁷ *Mississippi Automated Resource Information System*, <http://www.maris.state.ms.us>.

roadblock locations are highly unlikely to spatially intersect census tract boundaries even if they reside within a street whose centerline forms a census tract boundary. These points will almost always be on one side of the tract boundary line.

80. This is not an issue specific to these data. Consequently, point-line spatial intersection is typically implemented within a buffer tolerance setting to capture the nature of the real world intersection of the phenomena under study.
81. For these data, I re-ran the spatial selection query using a 20 meter (65.6 feet) buffer distance around the census tract boundary lines. Any point within 20 meters of a census tract boundary line would return TRUE for intersecting with that line. The 20 meter buffer distance is specific to this application. This distance is designed to approximate the maximum width of a two-lane street with parking on both sides given that most lane widths vary from approximately three to five meters (9 to 15 feet).
82. The spatial selection query identified 82 roadblock points representing 662 roadblocks within 20 meters of a census tract boundary line. These values are consistent with Mr. Funderburk's findings.⁵⁸
83. The map below shows the location of these border roadblocks relative to the census tract classification scheme used in Exhibit 2 of Dr. Ricchetti's report which clearly demarks census tracts with a relatively higher black population percentage (dark blue) or relatively lower black population percentage (light blue). It is worth noting that four of the purported boundary roadblocks identified by Mr. Funderburk – accounting for 121 roadblocks – are on the border between a single census tract in Madison County and another tract *outside* Madison County. Thus, there is no uncertainty about the assignment to the relevant census tracts for these roadblocks.

⁵⁸ Funderburk Report, ¶ 57.

EXHIBIT 4***Roadblocks within 20 meters of Census Tract Boundaries within Madison County (2012-2017)***

Source: Census TIGER Line Tract boundary data for Madison County, 2015; Compiled List of Unique Roadblocks

84. Assuming that the roadblocks that occurred at one of these point locations along the border of adjoining census tracts could be assigned to any census tract within the 20 meter buffer distance, I used the ArcGIS *Generate Near Table Analysis* tool to identify all census tracts within 20 meters of each of these 82 roadblock points.
85. I joined the resultant *Near Analysis Output* table to the table of *Compiled Unique Roadblocks* by IN_FID, which is the identifier that links these two tables, to have more information about each roadblock point like *clean_address*. Similarly, I joined the census tract tabular data to the *Near Analysis Table* by NEAR_FID in order to add the census tract identifier (GEOID) for each census tract that was near the input roadblock point.
86. I exported the resulting table to a CSV file to further process it in R, a statistical programming software tool. I joined the tabular data in Exhibit I of Dr. Ricchetti's report to the *Near Analysis Output* table in order to have a value for *average black population percentage* for each census tract that was identified by the near analysis.

Using this expanded table, I calculated for each roadblock point the minimum and maximum black population percentages of the census tracts to which it could have been assigned – i.e., the census tracts it bordered.

87. I then identified the roadblock points that could have been but were not assigned to the tract with the maximum black population percentage. I repeated this process to identify the roadblock points that could have been but were not assigned to the tract with the minimum black population percentage. The results of this analysis are included in Appendix D.
88. The summary statistics for this table show that 327 roadblocks occurring at 36 different locations could have been assigned to census tracts with a higher black population percentage. The table also show that 216 roadblocks occurring at 44 different locations could have been assigned to census tracts with a lower black population percentage. In other words, there were more roadblocks that could have been assigned to tracts with a higher black population than roadblocks that could have been assigned to tracts with a lower black population.⁵⁹
89. Contrary to what Mr. Funderburk suggests, this finding does not weaken or invalidate Dr. Ricchetti's analysis. Rather, this result suggests that Dr. Ricchetti's results are, if anything, more conservative than the true distribution.

⁵⁹ Four roadblock points (1, 101, 139, 234) that were the site of a total of 121 roadblocks were near a tract border that was also the border of Madison County and did not border another tract within Madison County. None of these roadblocks could have been assigned to any other tracts in Madison County. Two roadblock points (259, 321), the site of two roadblocks, were near the border of more than two tracts and could have been assigned to a tract with a higher or a lower percent black population.

4. CONCLUSION

90. I find that Dr. Ricchetti's geocoding was accurate, precise, and reliable. Dr. Ricchetti uses a highly regarded geocoding software, ArcGIS World Geocoding Service, to ensure high reliability in his geocoding output. Moreover, Dr. Ricchetti uses a standard metric of geocoding quality to evaluate positional accuracy and precision, the geocoding *match score*. He sets his match score threshold to 90 out of 100 to increase the level accuracy and precision in his geocoding output. Based on the academic literature, this is a relatively high match score cutoff.
91. Mr. Funderburk, on the other hand, claims that Dr. Ricchetti's geocoding was not accurate, precise, or reliable without offering clear definitions of what these terms mean or providing support for these claims. He implements no statistically sound or standard method of evaluating the accuracy, precision, or reliability of the geocoded locations. Mr. Funderburk attempts to use ground truthing to assess positional accuracy but his implementation of the method is not based on best practices. He fails to meet the professional standard of using a randomized sample in his analysis. Thus, any conclusions he draws about positional accuracy cannot be generalized to a statement about the geocoding quality of the data set as a whole.
92. Mr. Funderburk's claim that street intersections cannot be geocoded accurately is simply not supported by my experience or the research literature. As detailed above, the research literature on geocoding does not provide benchmarks for acceptable levels of geocoding positional accuracy and precision. Rather, the literature notes that acceptable levels for these characteristics are dependent on how the results of geocoding will be used.⁶⁰ Mr. Funderburk does not consider the positional accuracy that would be needed to locate a point in a street intersection within a census tract, which is how the geocoded points are used in Dr. Ricchetti's analysis. Setting aside the issue of roadblocks on census tract boundaries, for the purposes of counting roadblocks within a census tract, a location geocoded to any point within a street intersection is perfectly sufficient. Thus, for the vast majority of roadblock locations in Dr. Ricchetti's analysis that were not on the boundary of census tracts, identifying a census tract is very straightforward.
93. Similarly, Mr. Funderburk alleges that the coordinate reference system may be driving several of Dr. Ricchetti's alleged "errors", but this claim is simply

⁶⁰ Zandbergen, Paul A., "Geocoding Quality and Implications for Spatial Analysis," *Geography Compass*, 3(2), 2009, pp. 647–680.

implausible given how small the magnitude of such differences would be given the application at hand.

94. While Mr. Funderburk notes that 82 roadblock locations are located on streets that are census tract boundaries, and thus could be said to straddle multiple census tracts, it is notable that Mr. Funderburk's analysis does not attempt to test how this could affect Dr. Ricchetti's analysis. He simply asserts that this type of measurement error "can have profound impacts on the number of roadblocks per census tract and is not a valid representation of what actually occurred," without offering any robustness test.⁶¹ In my experience and in the research literature, there are standard ways to test whether the potential for error in a subset of data points will impact an analysis.⁶²
95. For example, one could perform exercises in which the roadblocks are assigned to the least and most favorable census tracts relative to the analysis in question. Mr. Funderburk did not perform any such analysis. I, however, performed this analysis on the 82 roadblocks located on census tract boundaries. My results show that Dr. Ricchetti's analysis is more likely to assign roadblocks on census tract borders to the census tract with the relatively *lower share* of the population that is black. Thus, Dr. Ricchetti's geocoding of the boundary roadblocks does not systematically increase the count of roadblocks in census tracts with a relatively high black population percentage.

Executed on July 2, 2018.



Patricia Frontiera, Ph.D.

⁶¹ Funderburk Report, ¶ 53.

⁶² Strickland, Matthew J., et al, "Quantifying Geocode Location Error Using GIS Methods," *Environmental Health*, 6(10), 2007.

Appendix A

PATRICIA FRONTIERA
SOCIAL SCIENCES DATA LAB (D-LAB)
University of California, Berkeley
pfrontiera@berkeley.edu

EDUCATION

PH.D. University of California, Berkeley, California. Environmental Planning. 2005.
Emphasis on geographic informational retrieval. Dissertation chair: John Radke.
M.L.I.S. University of California, Berkeley, California. Library & Information Studies. 1992.
B.A. Wellesley College, Wellesley, Massachusetts. History. 1984

RECENT PROFESSIONAL POSITIONS

2017 - **Geospatial Data Scientist, Social Sciences Data Lab (D-Lab), UC Berkeley**
present Lead, advise, participate in and collaborate on research projections with a geographic data, mapping and or visualization component. Provide consulting and instructional services to the UC Berkeley community on related topics.

2014 – 2017 **Academic Coordinator, Social Sciences Data Lab, UC Berkeley**
With a team of dedicated and talented colleagues, planned, developed, delivered and coordinated an instructional workshop program to support graduate-level data intensive social science research. Topic lead for trainings related to geospatial data and analysis.

TEACHING EXPERIENCE

2015-17 University of CA, Berkeley, Lecturer, Data Science Education Program
Geospatial Data Exploration and Visualization (ESPM88x)

2012 University of CA, Berkeley, Lecturer, City and Regional Planning
Introduction to GIS and City Planning (CP204C)

2010 University of CA, Berkeley, Lecturer, Environmental Science & Policy Management
Introduction to Geographic Information Systems (ESPM 72)

2005 University of CA, Berkeley, Lecturer, Landscape Architecture
Quantitative Methods in Environmental Planning (LA221)

PREVIOUS PROFESSIONAL POSITIONS

- 2008 - 2014 **Senior GIS Technology Specialist**, The San Francisco Estuary Institute
- Research on and development of custom web mapping applications and spatial analysis tools for exploring data and sharing information with a diverse group of stakeholders including scientists, planners, resource managers and the general public.
- 2005 - 2006 **Post-doctoral Researcher**, College of Natural Resources, UC Berkeley
- Researched structure vulnerability to wildfire in the wildland-urban interface. This work served as the basis of the wildfire risk and hazard assessment toolkit developed by the Center for Fire Research and Outreach.
- 1996 - 2003 **GIS Project Manager, Programmer/Analyst III**
Geographic Information Science Center, UC Berkeley, 2003
- Managed all aspects of GIS projects, including preparing work plans and budgets, supervising student employees, advising on and troubleshooting technical issues, and interacting with current and prospective clients as well as with related campus groups.
- Center for Environmental Design Research, UC Berkeley, 1996-2002
- As a member of the research group REGIS (Research Program in Environmental Planning and Geographic Information Systems), pioneered the development and use of open standards and technologies for web-based access to geographic information for natural resource management and environment planning applications
- 1993 – 1996 **Computer Lab Manager**, City and Regional Planning / Landscape Architecture and Environmental Planning, UC Berkeley
- Managed hardware and software resources for two departmental computer labs. This included a local area network of 50+ MS Windows-based and Mac computers, UNIX workstations, printers, plotters, scanners, and digitizers.
- 1990-1991 **Circulation Supervisor**, Main Library, UC Berkeley,
- Hired, trained, and supervised two full-time and 20+ part-time student library employees.

PUBLICATIONS AND PRESENTATIONS

- Frontiera, P. (2018 June). Tools and Techniques for Interactive Data Visualizations. Presented at the Berkeley Interdisciplinary Migration Institute Summer Workshop in Migration Research Methods.
- Frontiera, P. (2017, March). *Geospatial Data and the Louisiana Slave Conspiracies Project*. Presented at the Digital Humanities for Caribbean History Workshop, Harvard, MA.

- Frontiera, P. (2016, April). *Comparison of Reference Data used for Geocoding US Addresses*. Presented at the Annual Meeting of the Association of American Geographers, San Francisco, CA.
- Powell, S., von Vacano, C., and Frontiera, P. (2016, April). *Teaching the Geospatial for Digital Humanities*. Presented at the Association of American Geographers Annual Mtg, San Francisco, CA.
- Frontiera, P. (2013, April). *Developing a dynamic web-based landscape profile tool*. Presented at the 19th Annual California GIS Conference (CalGIS), Long Beach, CA.
- Frontiera, P. (2011, May). *Spatial methods for browsing and searching multi-media resource collections*. Invited speaker at the Plenary session of the Nevada GIS Annual Conference, organized by the National Archives and Records Administration, Reno, NV.
- Frontiera, P. (2010). Spatial data integration. In: B. Warf (Ed.) *Encyclopedia of Geography*, Thousand Oaks, CA: Sage.
- Frontiera, P. (2008). *Proceedings of the ACM 17th Conference on Information and Knowledge Management: Flamenco + Geo: extending a search interface based on hierarchical faceted metadata with geographic capabilities*. (GIR'08) Napa, Ca.
- Frontiera, P., Larson, R. & Radke, J. (2008). A comparison of geometric approaches to assessing spatial similarity for geographic information retrieval. *International Journal of Geographical Information Science*, 22:3, 337 - 360.
- Frontiera, P., & Foster, H. (2007, April). *Spatial approaches to representation and ranking for geographic information retrieval*. Presented at the Annual Meeting of the Association of American Geographers, San Francisco, CA.
- Moritz, M.A., Kelly, M., Kearns, F., Frontiera, P., Casey Cleve, C., Sapp, J., Waite, S. & Goldstein, N. (2006, March). *A webGIS decision-support tool for parcel-based fire hazard assessment in California*. Presented at the Annual Meeting of the Association of American Geographers, Chicago.
- Radke, J., Xu, J. & Frontiera, P. (2005, August). *Establishing concave geometric approximations to better capture spatial location, extent and shape for geographic information retrieval*. Presented at the 8th International Conference on GeoComputation (GeoComputation 2005), Ann Arbor, MI.
- Frontiera, P. (2004). *A probabilistic approach to spatial ranking for geographic information retrieval*. (Unpublished doctoral dissertation). University of California, Berkeley.
- Larson, R.R., & Frontiera, P. (2004, September). Spatial ranking methods for geographic information retrieval (GIR) in Digital Libraries. In Heery, R. & Lyon, L. (Eds), *Research and Advanced Technology for Digital Libraries: 8th European Conference on Digital Libraries (ECDL'04)*, Bath, UK. Springer LNCS 3232: 45-56. **(This paper received the conference DELOS award for Best Paper).**
- Larson, R.R., & Frontiera, P. (2004, July). *Ranking and representation for geographic information retrieval*. Presented at SIGIR 2004 Workshop on Geographic Information Retrieval. Sheffield, UK.
- Landis, J., Reilly, M., Twiss, R., Foster, H., and Frontiera, P. (2001). Forecasting and mitigating future urban encroachment adjacent to CA military installations, *IURD Working Paper*, University of CA, Berkeley.
- Frontiera, P. (2001, March). *Spatial metadata and geographic knowledge discovery*. Presented at the 92nd Conference of the American Planning Association, New Orleans, LA.

Appendix B

Documents Considered by Patricia Frontiera, Ph.D.

Expert Report

Expert Report of Bryan Ricchetti, Ph D with associated exhibits, appendices, and production	March 13, 2018
Expert Report of William R Funderburk with associated exhibits, appendices, and production	May 8, 2018

Depositions

Deposition of Bryan Ricchetti, Ph D	April 6, 2018
Deposition of William R Funderburk	June 20, 2018

Academic Literature

Abe, Toshi, and David Stinchcomb, "Geocoding Practices in Cancer Registries," Gerard Rushton et al , (Eds), <i>Geocoding Health Data: The Use of Geographic Codes in Cancer Prevention and Control, Research and Practice</i> , CRC Press, Boca Raton, Florida, pp 111–125	2008
Bigham, John M , et al , "Geocoding Police Collision Report Data from California: A Comprehensive Approach," <i>International Journal of Health Geographics</i> , 8(72), pp 1–10	2009
Duncan, Dustin T , et al , "Evaluation of the Positional Difference Between Two Common Geocoding Methods," <i>Geospatial Health</i> , 5(2), pp 265–273	2011
Dutta, Arup, et al , "System for Digitizing Information on Wisconsin's Crash Locations," <i>Journal of the Transportation Research Board</i> , (19), pp 256–264	2007
Goldberg, Daniel W , "A Geocoding Best Practices Guide," <i>The North American Association of Central Cancer Registries</i>	2008
Goldberg, Daniel W , John P Wilson, and Craig A Knoblock, "From Text to Geographic Coordinates: The Current State of Geocoding," <i>Journal of the Urban and Regional Information Systems Association</i> , 19(1), pp 33–46	2007
Krieger, Nancy, "A Century of Census Tracts: Health & the Body Politic (1906 –2006)," <i>Journal of Urban Health: Bulletin of the New York Academy of Medicine</i> , 83(3), pp 355–361	2006
Krieger, Nancy, et al , "Geocoding and Monitoring of US Socioeconomic Inequalities in Mortality and Cancer Incidence: Does the Choice of Area-based Measure and Geographic Level Matter?," <i>American Journal of Epidemiology</i> , 156(5), pp 471–482	2002
Levine, Ned, and Karl E Kim, "The Location of Motor Vehicle Crashes in Honolulu: A Methodology for Geocoding Intersections," <i>Computers, Environment and Urban Systems</i> , 22(6), pp 557–576	1998
Park, Shin Hyoung, et al , "Geocoding Vehicle Collisions on Korean Expressways Based on Postmile Referencing," <i>Journal of Civil Engineering</i> , 15(8), pp 1435–1441	2011
Qin, Xiao, et al , "Intelligent Geocoding System to Locate Traffic Crashes," <i>Accident Analysis and Prevention</i> , 50, pp 1034–1041	2013
Ratcliffe, Jerry H , "Geocoding Crime and a First Estimate of a Minimum Acceptable Hit Rate," <i>International Journal of Geographical Information Science</i> , 18(1), pp 61–72	2004
Roongpiboonsopit, Duangduen, and Hassan A Karimi, "Comparative Evaluation and Analysis of Online Geocoding Services," <i>International Journal of Geographical Information Science</i> , 24(7), pp 1081–1100	2010
Schootman, Mario, et al , "Positional Accuracy and Geographic Bias of Four Methods of Geocoding in Epidemiologic Research," <i>Annals of Epidemiology</i> , 17(6), pp 464–470	2007
<i>Spatial and Spatio-temporal Epidemiology</i> , 3(2)	2012
Strickland, Matthew J , et al , "Quantifying Geocode Location Error Using GIS Methods," <i>Environmental Health</i> , 6(10), pp 1–8	2007
Yang, Duck-Hye et al , "Improving Geocoding Practices: Evaluation of Geocoding Tools," <i>Journal of Medical Systems</i> , 28(4), pp 361–370	2004
Zandbergen, Paul A , "A Comparison of Address Point, Parcel and Street Geocoding Techniques," <i>Computers, Environment and Urban Systems</i> , 32(3), pp 214–232	2008
Zandbergen, Paul A , "Geocoding Quality and Implications for Spatial Analysis," <i>Geography Compass</i> , 3(2), pp 647–680	2009
Zhan, F B et al , "Match Rate and Positional Accuracy for Two Geocoding Methods for Epidemiologic Research," <i>Annals of Epidemiology</i> , 16(11), pp 842–849	2006

Documents Considered by Patricia Frontiera, Ph.D.

Public Press/Websites

2017 TIGER/Line Shapefiles Technical Documentation, available at *U.S. Census Bureau* ,
https://www2.census.gov/geo/pdfs/maps-data/data/tiger/tgrshp2017/TGRSHP2017_TechDoc_Ch1.pdf

Fromhertz, Pamela, "Datums and Tools to Connect Geospatial Data Accurately," *National Oceanic and Atmospheric Administration* , available at

June 20, 2012

https://www.ngs.noaa.gov/web/science_edu/presentations_library/files/usgs_css_brownbag20june2012final.pdf

Mississippi Automated Resource Information System , <http://www.maris.state.ms.us>

Positional Accuracy of TIGER/Line Data, available at *U.S. Census Bureau* ,
https://www.census.gov/geo/landview/lv6help/pos_acc.html

Service Output, available at *ArcGIS for Developers* , <https://developers.arcgis.com/rest/geocode/api-reference/geocoding-service-output.htm>

The Public Health Disparities Geocoding Project, available at Harvard T H Chan School of Public Health,
<https://www.hsph.harvard.edu/thegeocodingproject>

Other

`arcgis_geocoding.py`

Appendix C

Compiled Unique Roadblocks

Point ID <i>rid</i>	Longitude <i>lon</i>	Latitude <i>lat</i>	Clean Address <i>clean_address</i>	Original Address <i>original_address</i>	Census Tract ID <i>geoid</i>	Number of Roadblocks <i>num_rbs</i>
1	-90.17706°	32.40025°	W COUNTY LINE RD AND I-220, MADISON COUNTY, MS	W COUNTY LINE RD / I-220 RID	28089030206	114
2	-90.03243°	32.61859°	DOBSON AVE AND YANDELL AVE, MADISON COUNTY, MS	DOBSON AVE / YANDELL AVE CAN	28089030600	78
3	-90.08861°	32.41169°	LOWER SPILLWAY RD, MADISON COUNTY, MS	LOWER SPILLWAY RD RID	28089030107	65
4	-90.10804°	32.40255°	OLD CANTON RD AND PINE KNOLL DR, MADISON COUNTY, MS	OLD CANTON RD / PINE KNOLL DR RID	28089030108	59
5	-90.01619°	32.61733°	HARGON ST AND COVINGTON DR, MADISON COUNTY, MS	HARGON ST / COVINGTON DR CAN	28089030600	48
6	-90.08585°	32.42646°	POST RD AND RICE RD, MADISON COUNTY, MS	POST RD / RICE RD CAN	28089030107	44
7	-90.08901°	32.70230°	OLD YAZOO CITY RD AND HWY 16, MADISON COUNTY, MS	OLD YAZOO CITY RD / HWY 16 CAN	28089030400	39
8	-90.03373°	32.64035°	W HWY 16 AND GREEN ACRES, MADISON COUNTY, MS	W HWY 16 / GREEN ACRES CAN	28089030600	38
9	-90.02047°	32.64771°	HWY 51 AND MORGAN RD, MADISON COUNTY, MS	HWY 51 / MORGAN RD CAN	28089030900	38
10	-89.98419°	32.83394°	HWY 43 AND GOODLOE RD, MADISON COUNTY, MS	HWY 43 / GOODLOE RD CAN	28089030900	34
11	-90.03488°	32.64034°	GREEN ACRES AND RAILROAD ST, MADISON COUNTY, MS	GREEN ACRES / RAILROAD ST CAN	28089030500	32
12	-89.94762°	32.54045°	PIPELINE RD AND HWY 43, MADISON COUNTY, MS	PIPELINE RD / HWY 43 CAN	28089030900	30
13	-89.93628°	32.62943°	HWY 16 E AND SHARON RD, MADISON COUNTY, MS	HWY 16 E / SHARON RD CAN	28089030900	25
14	-89.97501°	32.52461°	HWY 43 AND NATCHEZ TRACE PKWY, MADISON COUNTY, MS	HWY 43 / NATCHEZ TRACE PKWY CAN	28089030201	25
15	-90.31688°	32.57612°	KEARNEY PARK RD AND MIDDLE RD, MADISON COUNTY, MS	KEARNEY PARK RD / MIDDLE RD FLO	28089030302	23
16	-89.99530°	32.58217°	HWY 43 AND RANKIN RD, MADISON COUNTY, MS	HWY 43 / RANKIN RD CAN	28089030900	23
17	-90.17293°	32.45587°	LAKE CASTLE RD AND RICHARDSON RD, MADISON COUNTY, MS	LAKE CASTLE RD / RICHARDSON RD CAN	28089030204	21
18	-90.09314°	32.41200°	HARBOR AND LAKE HARBOR, MADISON COUNTY, MS	HARBOR / LAKE HARBOR CAN	28089030107	20
19	-89.98714°	32.61306°	HWY 16 AND AVONDALE RD, MADISON COUNTY, MS	HWY 16 / AVONDALE RD CAN	28089030600	19
20	-90.10651°	32.40515°	OLD CANTON RD AND WILLIAM BLVD, MADISON COUNTY, MS	OLD CANTON RD / WILLIAM BLVD RID	28089030108	19
21	-90.04395°	32.58722°	HWY 51 AND CORRECTIONS DR, MADISON COUNTY, MS	HWY 51 / CORRECTIONS DR CAN	28089030400	19
22	-90.10635°	32.41099°	HARBOUR PT XING AND OLD CANTON, MADISON COUNTY, MS	HARBOUR PT XING / OLD CANTON RID	28089030106	18
23	-90.00993°	32.66200°	HWY 51 AND STUMP BRIDGE RD, MADISON COUNTY, MS	HWY 51 / STUMP BRIDGE RD CAN	28089030900	18
24	-90.34702°	32.58657°	LIVINGSTON VERNON RD AND HWY 49, MADISON COUNTY, MS	LIVINGSTON VERNON RD / HWY 49 CAN	28089030302	17
25	-90.13207°	32.40682°	TOWNE CENTER AND WHEATLEY, MADISON COUNTY, MS	TOWNE CENTER / WHEATLEY RID	28089030106	17
26	-90.03995°	32.61873°	RAILROAD ST AND GEORGE WASHINGTO, MADISON COUNTY, MS	RAILROAD ST / GEORGE WASHINGTO CAN	28089030500	16
27	-90.00690°	32.59394°	S HWY 43 AND CANTON PARKWAY, MADISON COUNTY, MS	S HWY 43 / CANTON PARKWAY CAN	28089030800	15
28	-90.05064°	32.61831°	388 RICKS DR, MADISON COUNTY, MS	388 RICKS DR CAN	28089030500	15
29	-90.21576°	32.55338°	HWY 463 AND HWY 22, MADISON COUNTY, MS	HWY 463 / HWY 22 CAN	28089030400	14
30	-90.05895°	32.60921°	W PEACE ST AND PLUMNER DR, MADISON COUNTY, MS	W PEACE ST / PLUMNER DR CAN	28089030500	14
31	-90.03978°	32.56027°	N OLD CANTON RD AND ENDRIS, MADISON COUNTY, MS	N OLD CANTON RD / ENDRIS CAN	28089030400	13
32	-90.03453°	32.62375°	N UNION ST AND MARTIN LUTHER KING, MADISON COUNTY, MS	N UNION ST / MARTIN LUTHER KING CAN	28089030600	13
33	-90.19194°	32.52423°	HWY 463 AND GLUCKSTADT RD, MADISON COUNTY, MS	HWY 463 / GLUCKSTADT RD MAD	28089030301	12
34	-89.75151°	32.76045°	HWY 43 AND CAUTHEN RD, MADISON COUNTY, MS	HWY 43 / CAUTHEN RD CAN	28089031000	12
35	-90.05486°	32.61625°	FOLEY AVE AND KING RANCH RD, MADISON COUNTY, MS	FOLEY AVE / KING RANCH RD CAN	28089030500	12
36	-90.04443°	32.61505°	MARTIN LUTHER KING DR AND N UNIO, MADISON COUNTY, MS	MARTIN LUTHER KING DR / N UNIO CAN	28089030500	11
37	-90.19989°	32.42081°	LIVINGSTON RD AND OLD AGENCY RD, MADISON COUNTY, MS	LIVINGSTON RD / OLD AGENCY RD CAN	28089030206	11
38	-90.08933°	32.60985°	VIRLILIA RD AND OLD YAZOO CITY R, MADISON COUNTY, MS	VIRLILIA RD / OLD YAZOO CITY R CAN	28089030400	11
39	-90.17659°	32.40026°	I-220 AND W COUNTY LINE RD, MADISON COUNTY, MS	I-220 / W COUNTY LINE RD CAN	28089030206	11
40	-89.96871°	32.84816°	HWY 51 AND HWY 17, MADISON COUNTY, MS	HWY 51 / HWY 17 CAN	28089031000	11
41	-89.94247°	32.71290°	SHARON RD AND STUMP BRIDGE RD, MADISON COUNTY, MS	SHARON RD / STUMP BRIDGE RD CAN	28089030900	11
42	-90.08634°	32.43253°	WRIGHTS MILL DR AND RICE RD, MADISON COUNTY, MS	WRIGHTS MILL DR / RICE RD MAD	28089030101	11
43	-90.18657°	32.45495°	N LIVINGSTON RD AND LAKE CASTLE RD, MADISON COUNTY, MS	N LIVINGSTON RD / LAKE CASTLE RD MAD	28089030302	10
44	-89.93623°	32.65844°	HWY 43 AND SHARON RD, MADISON COUNTY, MS	HWY 43 / SHARON RD CAN	28089030900	10
45	-90.27290°	32.49579°	ROBINSON SPRINGS RD AND POCAHONTAS, MADISON COUNTY, MS	ROBINSON SPRINGS RD / POCAHONTAS FLO	28089030302	10
46	-90.10394°	32.40173°	PINE KNOLL DR, MADISON COUNTY, MS	PINE KNOLL DR RID	28089030108	9
47	-90.04323°	32.62372°	619 MARTIN LUTHER KING DR, MADISON COUNTY, MS	619 MARTIN LUTHER KING DR CAN	28089030500	9

Compiled Unique Roadblocks

Point ID rid	Longitude lon	Latitude lat	Clean Address clean_address	Original Address original_address	Census Tract ID geoid	Number of Roadblocks num_rbs
48	-90 07125°	32 53918°	HWY 51 AND SOWELL RD, MADISON COUNTY, MS	HWY 51 / SOWELL RD CAN	28089030400	9
49	-89 97754°	32 52706°	HWY 43 AND YANDELL RD, MADISON COUNTY, MS	HWY 43 / YANDELL RD CAN	28089030201	9
50	-90 24606°	32 58062°	LIVINGSTON VERNON RD AND STOKES, MADISON COUNTY, MS	LIVINGSTON VERNON RD / STOKES CAN	28089030302	8
51	-89 99343°	32 51694°	YANDELL RD AND TWELVE OAKS TRACE, MADISON COUNTY, MS	YANDELL RD / TWELVE OAKS TRACE CAN	28089030201	8
52	-90 06342°	32 46510°	HOY RD AND OLD RICE RD, MADISON COUNTY, MS	HOY RD / OLD RICE RD MAD	28089030201	8
53	-90 09884°	32 41167°	SPILLWAY RD AND BREAKERS LN, MADISON COUNTY, MS	SPILLWAY RD / BREAKERS LN RID	28089030108	8
54	-90 04875°	32 61854°	BOYD ST AND GEORGE WASHINGTON AV, MADISON COUNTY, MS	BOYD ST / GEORGE WASHINGTON AV CAN	28089030500	8
55	-90 03732°	32 62369°	JAMES ST AND MARTIN LUTHER KING, MADISON COUNTY, MS	JAMES ST / MARTIN LUTHER KING CAN	28089030600	8
56	-90 00256°	32 69114°	HWY 51 AND DAVIS CROSSING, MADISON COUNTY, MS	HWY 51 / DAVIS CROSSING CAN	28089030900	7
57	-90 13654°	32 58305°	HWY 22 AND CATLETT RD, MADISON COUNTY, MS	HWY 22 / CATLETT RD CAN	28089030400	7
58	-89 99523°	32 56037°	HWY 43 AND ENDRIS RD, MADISON COUNTY, MS	HWY 43 / ENDRIS RD CAN	28089030900	7
59	-90 14375°	32 42818°	NATCHEZ TRACE PKWY AND I-55, MADISON COUNTY, MS	NATCHEZ TRACE PKWY / I-55 RID	28089030105	7
60	-90 05764°	32 47233°	OLD RICE RD AND SHADOW HILL DR, MADISON COUNTY, MS	OLD RICE RD / SHADOW HILL DR CAN	28089030201	7
61	-90 03806°	32 51933°	OLD CANTON RD AND YANDELL RD, MADISON COUNTY, MS	OLD CANTON RD / YANDELL RD CAN	28089030400	7
62	-90 04861°	32 58080°	RICE RD AND PEAR ORCHARD RD, MADISON COUNTY, MS	RICE RD / PEAR ORCHARD RD CAN	28089030400	7
63	-90 17767°	32 53667°	124 N I-55, MADISON COUNTY, MS	124 N I-55 CAN	28089030400	7
64	-90 20086°	32 44432°	LAKE CAVALIER RD AND N LIVINGSTON, MADISON COUNTY, MS	LAKE CAVALIER RD / N LIVINGSTON MAD	28089030302	7
65	-90 30367°	32 51155°	HWY 49 AND PETRIFIED FOREST RD, MADISON COUNTY, MS	HWY 49 / PETRIFIED FOREST RD CAN	28089030302	6
66	-90 08824°	32 43537°	BREEZY HILL DR AND RICE RD, MADISON COUNTY, MS	BREEZY HILL DR / RICE RD MAD	28089030101	6
67	-90 12352°	32 42500°	RICE RD AND PEAR ORCHARD RD, MADISON COUNTY, MS	RICE RD / PEAR ORCHARD RD RID	28089030104	6
68	-90 10031°	32 40473°	WILLIAM BLVD, MADISON COUNTY, MS	WILLIAM BLVD CAN	28089030108	6
69	-90 04859°	32 62272°	HOLMES AVE AND MACE ST, MADISON COUNTY, MS	HOLMES AVE / MACE ST CAN	28089030500	6
70	-90 33251°	32 57169°	HWY 49 AND MIDDLE RD, MADISON COUNTY, MS	HWY 49 / MIDDLE RD CAN	28089030302	6
71	-89 99081°	32 74889°	HWY 51 AND WAY RD, MADISON COUNTY, MS	HWY 51 / WAY RD CAN	28089031000	6
72	-90 03845°	32 62370°	RAILROAD ST AND MARTIN LUTHER KING, MADISON COUNTY, MS	RAILROAD ST / MARTIN LUTHER KING CAN	28089030500	6
73	-90 03853°	32 62370°	MARTIN LUTHER KING DR AND RAILROAD, MADISON COUNTY, MS	MARTIN LUTHER KING DR / RAILROAD CAN	28089030500	6
74	-90 03064°	32 62256°	RICHARD CIR, MADISON COUNTY, MS	RICHARD CIR CAN	28089030800	5
75	-89 87284°	32 69706°	HWY 43 AND SULPHUR SPRINGS RD, MADISON COUNTY, MS	HWY 43 / SULPHUR SPRINGS RD CAN	28089030900	5
76	-90 13625°	32 55328°	STOUT RD AND CATLETT RD, MADISON COUNTY, MS	STOUT RD / CATLETT RD CAN	28089030400	5
77	-90 10902°	32 41405°	LAKE HARBOUR DRIVE AND RANKIN, MADISON COUNTY, MS	Lake Harbour Drive / Rankin	28089030104	5
78	-90 08939°	32 59407°	OLD JACKSON RD AND HWY 22, MADISON COUNTY, MS	OLD JACKSON RD / HWY 22 CAN	28089030400	5
79	-90 02678°	32 63860°	RR AND GREEN ACRES, MADISON COUNTY, MS	RR / GREEN ACRES CAN	28089030600	5
80	-90 15769°	32 51791°	GLUCKSTADT RD AND DEWEES RD, MADISON COUNTY, MS	GLUCKSTADT RD / DEWEES RD CAN	28089030301	5
81	-90 09998°	32 58411°	HWY 22 AND CALHOUN PKWY, MADISON COUNTY, MS	HWY 22 / CALHOUN PKWY CAN	28089030400	5
82	-90 04471°	32 58624°	2935 HWY 51, MADISON COUNTY, MS	2935 HWY 51 CAN	28089030400	5
83	-90 17540°	32 42945°	122 NATCHEZ TRACE PKWY, MADISON COUNTY, MS	122 NATCHEZ TRACE PKWY CAN	28089030205	5
84	-89 90604°	32 63900°	HWY 16 AND RATLIFF FERRY RD, MADISON COUNTY, MS	HWY 16 / RATLIFF FERRY RD CAN	28089030900	5
85	-89 80946°	32 71561°	HWY 17 AND SULPHUR SPRINGS RD, MADISON COUNTY, MS	HWY 17 / SULPHUR SPRINGS RD CAN	28089031000	5
86	-90 36658°	32 49876°	HWY 22 AND SPRING CREEK RD, MADISON COUNTY, MS	HWY 22 / SPRING CREEK RD CAN	28089030302	5
87	-90 04675°	32 61502°	BOYD ST AND WEST NORTH, MADISON COUNTY, MS	BOYD ST / WEST NORTH CAN	28089030500	5
88	-90 30414°	32 54594°	HWY 22 AND BANNERMAN DR, MADISON COUNTY, MS	HWY 22 / BANNERMAN DR FLO	28089030302	5
89	-90 13200°	32 51692°	GLUCKSTADT RD AND CATLETT RD, MADISON COUNTY, MS	GLUCKSTADT RD / CATLETT RD CAN	28089030400	4
90	-90 09339°	32 58894°	NISSAN PKWY AND HWY 22, MADISON COUNTY, MS	NISSAN PKWY / HWY 22 CAN	28089030400	4
91	-90 04230°	32 61015°	CANAL ST AND W ACADEMY ST, MADISON COUNTY, MS	CANAL ST / W ACADEMY ST CAN	28089030500	4
92	-90 08905°	32 54971°	OLD JACKSON RD AND I-55, MADISON COUNTY, MS	OLD JACKSON RD / I-55 MAD	28089030400	4
93	-90 03763°	32 62758°	RAILROAD ST, MADISON COUNTY, MS	RAILROAD ST CAN	28089030500	4
94	-90 04050°	32 49149°	N OLD CANTON RD AND DAVE BROWN RD, MADISON COUNTY, MS	N OLD CANTON RD / DAVE BROWN RD CAN	28089030201	4

Compiled Unique Roadblocks

Point ID <i>rid</i>	Longitude <i>lon</i>	Latitude <i>lat</i>	Clean Address <i>clean_address</i>	Original Address <i>original_address</i>	Census Tract ID <i>geoid</i>	Number of Roadblocks <i>num_rbs</i>
95	-89.83875°	32.78221°	LORING RD AND HWY 17, MADISON COUNTY, MS	LORING RD / HWY 17 CAN	28089031000	4
96	-90.04422°	32.62127°	MLK AND ADELINE ST, MADISON COUNTY, MS	MLK / ADELINE ST CAN	28089030500	4
97	-89.82129°	32.74313°	HWY 17 AND HWY 43, MADISON COUNTY, MS	HWY 17 / HWY 43 CAN	28089031000	4
98	-90.07178°	32.51710°	YANDELL RD AND CLARKDELL RD, MADISON COUNTY, MS	YANDELL RD / CLARKDELL RD CAN	28089030400	4
99	-90.30883°	32.54264°	RAILROAD AV AND CMU, MADISON COUNTY, MS	RAILROAD AV / CMU CAN	28089030302	4
100	-90.07054°	32.51711°	YANDELL RD AND MADISON CROSSING, MADISON COUNTY, MS	YANDELL RD / MADISON CROSSING MAD	28089030400	4
101	-90.18200°	32.40020°	W COUNTY LINE AND HIGHLAND COLONY, MADISON COUNTY, MS	W COUNTY LINE / HIGHLAND COLONY CAN	28089030206	4
102	-90.04027°	32.61508°	RAILROAD ST AND W NORTH ST, MADISON COUNTY, MS	RAILROAD ST / W NORTH ST CAN	28089030500	4
103	-90.04423°	32.61858°	GEORGE WASHINGTON AVE AND KING R, MADISON COUNTY, MS	GEORGE WASHINGTON AVE / KING R CAN	28089030500	4
104	-90.03175°	32.62266°	RICHARD CIR AND DOBSON AVE, MADISON COUNTY, MS	RICHARD CIR / DOBSON AVE CAN	28089030600	4
105	-89.98656°	32.77808°	HWY 51 AND LORING RD, MADISON COUNTY, MS	HWY 51 / LORING RD CAN	28089031000	4
106	-90.03940°	32.61135°	CAMERON ST AND W FULTON ST, MADISON COUNTY, MS	CAMERON ST / W FULTON ST CAN	28089030700	4
107	-89.76596°	32.74020°	SULPHUR SPRING RD AND GIN RD, MADISON COUNTY, MS	SULPHUR SPRING RD / GIN RD CAN	28089030900	4
108	-90.09547°	32.49241°	HWY 51 AND GREEN OAK LN, MADISON COUNTY, MS	HWY 51 / GREEN OAK LN CAN	28089030204	4
109	-90.10649°	32.44727°	OLD CANTON RD AND CALUMET DR, MADISON COUNTY, MS	OLD CANTON RD / CALUMET DR CAN	28089030101	4
110	-90.10625°	32.41099°	HARBOUR POINTE CROSSING AND NORT, MADISON COUNTY, MS	HARBOUR POINTE CROSSING / NORT RID	28089030108	4
111	-90.28584°	32.55144°	HWY 22 AND ANDOVER DR, MADISON COUNTY, MS	HWY 22 / ANDOVER DR CAN	28089030302	4
112	-90.28812°	32.58969°	LIVINGSTON VERNON RD AND ST CHAR, MADISON COUNTY, MS	LIVINGSTON VERNON RD / ST CHAR FLO	28089030302	3
113	-90.09117°	32.46505°	HOY RD AND RICE RD, MADISON COUNTY, MS	HOY RD / RICE RD MAD	28089030202	3
114	-90.16108°	32.44203°	STEED RD AND RICHARDSON RD, MADISON COUNTY, MS	STEED RD / RICHARDSON RD CAN	28089030205	3
115	-90.01183°	32.63320°	FINNEY RD AND MORGAN RD, MADISON COUNTY, MS	FINNEY RD / MORGAN RD CAN	28089030600	3
116	-89.93620°	32.61851°	ROBINSON RD AND SHARON RD, MADISON COUNTY, MS	ROBINSON RD / SHARON RD CAN	28089030900	3
117	-90.18071°	32.49437°	REUNION PKWY AND HWY 463, MADISON COUNTY, MS	REUNION PKWY / HWY 463 MAD	28089030301	3
118	-90.20074°	32.48393°	ROBINSON SPRINGS RD AND POC, MADISON COUNTY, MS	ROBINSON SPRINGS RD / POC CAN	28089030302	3
119	-90.03204°	32.63382°	1415 W HWY 16, MADISON COUNTY, MS	1415 W HWY 16 CAN	28089030800	3
120	-90.19274°	32.53379°	HWY 463 AND STRIBLING RD, MADISON COUNTY, MS	HWY 463 / STRIBLING RD MAD	28089030400	3
121	-90.02982°	32.63197°	W HWY 16 AND HWY 51, MADISON COUNTY, MS	W HWY 16 / HWY 51 CAN	28089030800	3
122	-90.10952°	32.46509°	HWY 463 AND MADISON MIDDLE, MADISON COUNTY, MS	HWY 463 / MADISON MIDDLE CAN	28089030203	3
123	-90.04636°	32.62125°	ADELINE ST AND SINGLETON ST, MADISON COUNTY, MS	ADELINE ST / SINGLETON ST CAN	28089030500	3
124	-89.96964°	32.52200°	HWY 43 AND TURCOTTE LAB DR, MADISON COUNTY, MS	HWY 43 / TURCOTTE LAB DR CAN	28089030900	3
125	-89.76804°	32.75790°	HWY 43 AND GIN RD, MADISON COUNTY, MS	HWY 43 / GIN RD CAR	28089031000	3
126	-90.04845°	32.58081°	HWY 51 AND HWY 16 W, MADISON COUNTY, MS	HWY 51 / HWY 16 W CAN	28089030400	3
127	-90.07056°	32.51712°	300 YANDELL RD, MADISON COUNTY, MS	300 YANDELL RD CAN	28089030400	3
128	-90.03489°	32.61584°	HWY 16 AND HWY 51, MADISON COUNTY, MS	HWY 16 / HWY 51 CAN	28089030600	3
129	-90.05051°	32.54239°	SMITH CARR AND E SOWELL RD, MADISON COUNTY, MS	SMITH CARR / E SOWELL RD CAN	28089030400	3
130	-90.28852°	32.51952°	POCAHONTAS RD AND MT LEOPARD RD, MADISON COUNTY, MS	POCAHONTAS RD / MT LEOPARD RD FLO	28089030302	3
131	-90.04566°	32.61856°	GEORGE WASHINGTON AVE AND RR, MADISON COUNTY, MS	GEORGE WASHINGTON AVE / RR CAN	28089030500	3
132	-90.02171°	32.62303°	INDUSTRIAL DR AND MATTHEWS AVE, MADISON COUNTY, MS	INDUSTRIAL DR / MATTHEWS AVE CAN	28089030800	3
133	-90.18177°	32.40091°	HIGHLAND COLONY PKWY, MADISON COUNTY, MS	HIGHLAND COLONY PKWY MAD	28089030206	3
134	-90.05479°	32.62356°	HOLMES AVE AND KING RANCH RD, MADISON COUNTY, MS	HOLMES AVE / KING RANCH RD CAN	28089030500	3
135	-90.31086°	32.58966°	LIVINGSTON VERNON RD AND HARRIS, MADISON COUNTY, MS	LIVINGSTON VERNON RD / HARRIS FLO	28089030302	3
136	-90.03756°	32.69114°	WAY RD AND DAVIS CROSSING RD, MADISON COUNTY, MS	WAY RD / DAVIS CROSSING RD CAN	28089030400	3
137	-90.02915°	32.62176°	WILSON ST AND RICHARD CIR, MADISON COUNTY, MS	WILSON ST / RICHARD CIR CAN	28089030600	3
138	-89.83578°	32.66105°	HWY 16 EAST AND PAT LUCKETT RD, MADISON COUNTY, MS	HWY 16 EAST / PAT LUCKETT RD CAN	28089030900	2
139	-90.20283°	32.40014°	N LIVINGSTON RD AND COUNTY LINE, MADISON COUNTY, MS	N LIVINGSTON RD / COUNTY LINE CAN	28089030206	2
140	-89.74710°	32.67308°	WALNUT RD AND NATCHEZ TRACE PKWY, MADISON COUNTY, MS	WALNUT RD / NATCHEZ TRACE PKWY CAN	28089030900	2
141	-90.12996°	32.42631°	HWY 51 AND NATCHEZ TRACE, MADISON COUNTY, MS	HWY 51 / NATCHEZ TRACE RID	28089030101	2

Compiled Unique Roadblocks

Point ID rid	Longitude lon	Latitude lat	Clean Address clean_address	Original Address original_address	Census Tract ID geoid	Number of Roadblocks num_rbs
142	-90 05891°	32.67738°	N HWY 55 AND 124, MADISON COUNTY, MS	N HWY 55 / 124 CAN	28089030400	2
143	-90 06363°	32.58545°	NISSAN PKWY AND NISSAN DR, MADISON COUNTY, MS	NISSAN PKWY / NISSAN DR CAN	28089030400	2
144	-90 03809°	32.52589°	OLD CANTON RD AND HARVEY CROSSIN, MADISON COUNTY, MS	OLD CANTON RD / HARVEY CROSSIN CAN	28089030400	2
145	-89 87010°	32.89688°	SULPHUR SPRINGS RD AND POTLUCK R, MADISON COUNTY, MS	SULPHUR SPRINGS RD / POTLUCK R CAN	28089030900	2
146	-90 04002°	32.61634°	RAILROAD ST AND BOWMAN ST, MADISON COUNTY, MS	RAILROAD ST / BOWMAN ST CAN	28089030500	2
147	-89 99324°	32.53900°	HWY 43 AND COTTON BLOSSOM RD, MADISON COUNTY, MS	HWY 43 / COTTON BLOSSOM RD CAN	28089030900	2
148	-89 85848°	32.80366°	RATLIFF FERRY RD AND BOYD DR, MADISON COUNTY, MS	RATLIFF FERRY RD / BOYD DR CAN	28089030900	2
149	-90 04962°	32.62435°	707 MACE ST, MADISON COUNTY, MS	707 MACE ST CAN	28089030500	2
150	-90 07275°	32.48780°	CLARKDELL RD AND GREEN OAK LN, MADISON COUNTY, MS	CLARKDELL RD / GREEN OAK LN CAN	28089030201	2
151	-90 07205°	32.51708°	YANDELL RD AND BRACEY RD, MADISON COUNTY, MS	YANDELL RD / BRACEY RD CAN	28089030400	2
152	-90 08808°	32.54776°	NISSAN DR AND OLD JACKSON RD, MADISON COUNTY, MS	NISSAN DR / OLD JACKSON RD CAN	28089030400	2
153	-90 05885°	32.58297°	HWY 51 AND LINKS DR, MADISON COUNTY, MS	HWY 51 / LINKS DR CAN	28089030400	2
154	-90.19946°	32.42228°	N LIVINGSTON RD AND NATCHEZ TRACE BRIDGE, MADISON COUNTY, MS	N LIVINGSTON RD / NATCHEZ TRACE BRIDGE MAD	28089030206	2
155	-90.17494°	32.56565°	MCMILLON RD AND HWY 22, MADISON COUNTY, MS	MCMILLON RD / HWY 22 MAD	28089030400	2
156	-90 07837°	32.54092°	SOWELL RD AND SOWELL RD, MADISON COUNTY, MS	SOWELL RD / SOWELL RD MAD	28089030400	2
157	-89 96033°	32.82167°	E HWY 16 AND ROYAL OAK RD, MADISON COUNTY, MS	E HWY 16 / ROYAL OAK RD CAN	28089030600	2
158	-90 02995°	32.61018°	ACADEMY ST AND LYON ST, MADISON COUNTY, MS	ACADEMY ST / LYON ST CAN	28089030800	2
159	-90 09471°	32.41666°	HARBOR DR, MADISON COUNTY, MS	HARBOR DR CAN	28089030107	2
160	-90 22270°	32.43443°	GREENS CROSSING RD, MADISON COUNTY, MS	GREENS CROSSING RD MAD	28089030302	2
161	-90 07616°	32.51581°	YANDELL RD AND CLARKDELL RD EXT, MADISON COUNTY, MS	YANDELL RD / CLARKDELL RD EXT CAN	28089030400	2
162	-90 03642°	32.60406°	UNION ST AND W DINKINS ST, MADISON COUNTY, MS	UNION ST / W DINKINS ST CAN	28089030700	2
163	-90 33125°	32.53838°	HWY 22 AND CHILDRESS LN, MADISON COUNTY, MS	HWY 22 / CHILDRESS LN CAN	28089030302	2
164	-90 22630°	32.47419°	COKER RD AND LAKE CAVALIER RD, MADISON COUNTY, MS	COKER RD / LAKE CAVALIER RD MAD	28089030302	2
165	-89 98380°	32.79604°	HWY 51 AND 2 J'S, MADISON COUNTY, MS	HWY 51 / 2 J'S CAN	28089031000	2
166	-90 03491°	32.60404°	S LIBERTY ST AND W DINKINS ST, MADISON COUNTY, MS	S LIBERTY ST / W DINKINS ST CAN	28089030700	2
167	-90 05691°	32.68188°	WHWY 16 AND I-55, MADISON COUNTY, MS	WHWY 16 / I-55 CAN	28089030400	2
168	-90 05068°	32.60635°	WESTSIDE DR AND ROSEBUD DR, MADISON COUNTY, MS	WESTSIDE DR / ROSEBUD DR CAN	28089030500	2
169	-90 08910°	32.55703°	OLD JACKSON RD AND STOUT RD, MADISON COUNTY, MS	OLD JACKSON RD / STOUT RD CAN	28089030400	2
170	-90 05154°	32.62369°	1106 HOLMES AV, MADISON COUNTY, MS	1106 HOLMES AV CAN	28089030500	2
171	-89 90176°	32.62046°	RATLIFF FERRY RD AND ROBINSON RD, MADISON COUNTY, MS	RATLIFF FERRY RD / ROBINSON RD CAN	28089030900	2
172	-90 08939°	32.53932°	W SOWELL RD AND OLD JACKSON RD, MADISON COUNTY, MS	W SOWELL RD / OLD JACKSON RD CAN	28089030400	2
173	-90 09277°	32.42121°	831 RICE RD, MADISON COUNTY, MS	831 RICE RD RID	28089030107	2
174	-90 03481°	32.61856°	YANDELL AVE AND N LIBERTY ST, MADISON COUNTY, MS	YANDELL AVE / N LIBERTY ST CAN	28089030600	2
175	-90 02471°	32.62009°	INDUSTRIAL DR AND LINCOLN ST, MADISON COUNTY, MS	INDUSTRIAL DR / LINCOLN ST CAN	28089030600	2
176	-90 08908°	32.64043°	HEINDL RD AND OLD YAZOO CITY RD, MADISON COUNTY, MS	HEINDL RD / OLD YAZOO CITY RD CAN	28089030400	2
177	-90.13915°	32.49762°	BOZEMAN RD AND REUNION ANNANDALE, MADISON COUNTY, MS	BOZEMAN RD / REUNION ANNANDALE CAN	28089030301	2
178	-90 04214°	32.61342°	N CANAL ST AND FRANKLIN ST, MADISON COUNTY, MS	N CANAL ST / FRANKLIN ST CAN	28089030500	2
179	-90 00771°	32.60390°	HWY 43 AND DINKINS ST, MADISON COUNTY, MS	HWY 43 / DINKINS ST CAN	28089030800	2
180	-90 05140°	32.62360°	HOLMES AV, MADISON COUNTY, MS	HOLMES AV CAN	28089030500	2
181	-90 05552°	32.62804°	DORIS FRANCIS BLVD AND HARRINGTO, MADISON COUNTY, MS	DORIS FRANCIS BLVD / HARRINGTO CAN	28089030500	2
182	-90 02713°	32.61855°	LINCOLN ST AND YANDELL AVE, MADISON COUNTY, MS	LINCOLN ST / YANDELL AVE CAN	28089030600	2
183	-90.15708°	32.47879°	HWY 463 AND MANNSDALE, MADISON COUNTY, MS	HWY 463 / MANNSDALE CAN	28089030204	2
184	-90 08881°	32.58500°	NISSAN PKWY AND OLD JACKSON RD, MADISON COUNTY, MS	NISSAN PKWY / OLD JACKSON RD CAN	28089030400	2
185	-90 39897°	32.54276°	COX FERRY RD AND PHILLIPS RD, MADISON COUNTY, MS	COX FERRY RD / PHILLIPS RD CAN	28089030302	1
186	-90 06363°	32.58545°	NISSAN DR AND NISSAN PKWY, MADISON COUNTY, MS	NISSAN DR / NISSAN PKWY CAN	28089030400	1
187	-90 09473°	32.54018°	SOWELL RD AND I-55, MADISON COUNTY, MS	SOWELL RD / I-55 MAD	28089030400	1
188	-90.10644°	32.45044°	OLD CANTON RD AND ST AUGUSTINE D, MADISON COUNTY, MS	OLD CANTON RD / ST AUGUSTINE D MAD	28089030101	1

Compiled Unique Roadblocks

Point ID rid	Longitude lon	Latitude lat	Clean Address clean_address	Original Address original_address	Census Tract ID geoid	Number of Roadblocks num_rbs
189	-90.19880°	32.43164°	N LIVINGSTON RD AND COU, MADISON COUNTY, MS	N LIVINGSTON RD / COU CAN	28089030302	1
190	-90.08907°	32.57500°	OLD JACKSON RD AND BEAL RD, MADISON COUNTY, MS	OLD JACKSON RD / BEAL RD CAN	28089030400	1
191	-90.10415°	32.50607°	PARKWAY EAST AND INDUSTRIAL DR S, MADISON COUNTY, MS	PARKWAY EAST / INDUSTRIAL DR S MAD	28089030204	1
192	-89.85936°	32.65295°	E HWY 16 AND HOGUE RD, MADISON COUNTY, MS	E HWY 16 / HOGUE RD CAN	28089030900	1
193	-90.07460°	32.51260°	CLARKDELL RD EXT AND YAN, MADISON COUNTY, MS	CLARKDELL RD EXT / YAN CAN	28089030201	1
194	-90.11701°	32.45051°	HWY 51 AND ST AUGUSTINE DR, MADISON COUNTY, MS	HWY 51 / ST AUGUSTINE DR MAD	28089030101	1
195	-90.07709°	32.54250°	W SOWELL RD AND RR TRACKS, MADISON COUNTY, MS	W SOWELL RD / RR TRACKS MAD	28089030400	1
196	-90.16147°	32.51903°	463 AND GLUCKSTADT RD, MADISON COUNTY, MS	463 / GLUCKSTADT RD CAN	28089030301	1
197	-90.05438°	32.61625°	FOLEY AVE AND SUNSET AVE, MADISON COUNTY, MS	FOLEY AVE / SUNSET AVE CAN	28089030500	1
198	-90.03641°	32.60582°	S UNION ST AND CAR WASH, MADISON COUNTY, MS	S UNION ST / CAR WASH CAN	28089030700	1
199	-90.05148°	32.56248°	147 LINKS DR, MADISON COUNTY, MS	147 LINKS DR CAN	28089030400	1
200	-89.84158°	32.62989°	MIGGINS RD AND ROBINSON RD, MADISON COUNTY, MS	MIGGINS RD / ROBINSON RD CAN	28089030900	1
201	-90.03671°	32.64455°	130 JOHNSON HILL RD, MADISON COUNTY, MS	130 Johnson Hill Rd	28089030400	1
202	-90.30957°	32.54312°	KEARNEY PARK RD AND HWY 22, MADISON COUNTY, MS	KEARNEY PARK RD / HWY 22 CAN	28089030302	1
203	-89.97251°	32.52278°	HWY 43 AND BROWNS LANDING RD, MADISON COUNTY, MS	HWY 43 / BROWNS LANDING RD CAN	28089030201	1
204	-90.14530°	32.40591°	HWY 51 HWY 17, MADISON COUNTY, MS	HWY 51 HWY 17 CAN	28089030105	1
205	-90.11557°	32.40315°	NORTH PARK DR AND AVERY BLVD, MADISON COUNTY, MS	NORTH PARK DR / AVERY BLVD RID	28089030106	1
206	-90.04945°	32.61853°	RR AND GEORGE WASHINGTON, MADISON COUNTY, MS	RR / GEORGE WASHINGTON CAN	28089030500	1
207	-89.98096°	32.53080°	HWY 43 AND RAMAGE RD, MADISON COUNTY, MS	HWY 43 / RAMAGE RD CAN	28089030900	1
208	-90.02631°	32.60899°	ADAMS STREET AND PEAR STREET, MADISON COUNTY, MS	Adams Street / Pear Street	28089030800	1
209	-90.02434°	32.62009°	INDUSTRIAL DR AND MILLER ST, MADISON COUNTY, MS	INDUSTRIAL DR / MILLER ST CAN	28089030600	1
210	-90.14375°	32.54635°	CAROLINE BLVD AND BELLEVUE DR, MADISON COUNTY, MS	CAROLINE BLVD / BELLEVUE DR CAN	28089030400	1
211	-90.05476°	32.63267°	HEINDL RD AND KING RANCH RD, MADISON COUNTY, MS	HEINDL RD / KING RANCH RD CAN	28089030500	1
212	-90.05071°	32.61852°	GEORGE WASHINGTON AVE AND RICKS, MADISON COUNTY, MS	GEORGE WASHINGTON AVE / RICKS CAN	28089030500	1
213	-90.08624°	32.43536°	RICE AND WOODS CROSSING BLVD, MADISON COUNTY, MS	RICE / WOODS CROSSING BLVD CAN	28089030101	1
214	-90.04424°	32.61856°	MARTIN LUTHER KING DR AND GEORGE, MADISON COUNTY, MS	MARTIN LUTHER KING DR / GEORGE CAN	28089030500	1
215	-90.13109°	32.42473°	RICE RD AND HWY 51, MADISON COUNTY, MS	RICE RD / HWY 51 CAN	28089030105	1
216	-90.10944°	32.57921°	HWY 22 AND LAKESHIRE PKWY, MADISON COUNTY, MS	HWY 22 / LAKESHIRE PKWY CAN	28089030400	1
217	-90.05656°	32.61002°	PEACE ST AND FULTON ST, MADISON COUNTY, MS	PEACE ST / FULTON ST CAN	28089030500	1
218	-89.84964°	32.59728°	NATCHEZ TRACE AND RATLIFF FERRY, MADISON COUNTY, MS	NATCHEZ TRACE / RATLIFF FERRY CAN	28089030900	1
219	-90.03639°	32.61137°	UNION ST AND W FULTON ST, MADISON COUNTY, MS	UNION ST / W FULTON ST CAN	28089030700	1
220	-90.03140°	32.62366°	DOBSON AVE AND SHERWOOD DR, MADISON COUNTY, MS	DOBSON AVE / SHERWOOD DR CAN	28089030600	1
221	-90.04207°	32.61504°	CANAL ST AND W NORTH ST, MADISON COUNTY, MS	CANAL ST / W NORTH ST CAN	28089030500	1
222	-89.83123°	32.67559°	LOTTVILLE RD AND JOHN DAY RD, MADISON COUNTY, MS	LOTTVILLE RD / JOHN DAY RD CAN	28089030900	1
223	-90.04634°	32.60637°	CAUTHEN ST AND ROSEBUD DR, MADISON COUNTY, MS	CAUTHEN ST / ROSEBUD DR CAN	28089030500	1
224	-90.03804°	32.53884°	N OLD CANTON RD AND COTTON BLOSSOM, MADISON COUNTY, MS	N OLD CANTON RD / COTTON BLOSSOM CAN	28089030400	1
225	-90.15770°	32.53746°	STRIBLING RD AND DEWEES, MADISON COUNTY, MS	STRIBLING RD / DEWEES CAN	28089030400	1
226	-90.04530°	32.60891°	W OTTO ST AND COWAN ST, MADISON COUNTY, MS	W OTTO ST / COWAN ST CAN	28089030500	1
227	-90.12356°	32.41132°	PEAR ORCHARD ROAD AND PEAR ORCHARD CIRCLE, MADISON COUNTY, MS	Pear Orchard Road/Pear Orchard Circle	28089030106	1
228	-89.76431°	32.68560°	HWY 16 EAST AND VIRGIN MARY RD, MADISON COUNTY, MS	HWY 16 EAST / VIRGIN MARY RD CAN	28089030900	1
229	-90.31272°	32.53870°	FIRST ST AND ODOM ST, MADISON COUNTY, MS	FIRST ST / ODOM ST CAN	28089030302	1
230	-89.90139°	32.61053°	RATLIFF FERRY RD AND LONE PINE R, MADISON COUNTY, MS	RATLIFF FERRY RD / LONE PINE R CAN	28089030900	1
231	-90.31288°	32.54216°	FIRST ST AND MAIN ST, MADISON COUNTY, MS	FIRST ST / MAIN ST FLO	28089030302	1
232	-90.02425°	32.62274°	GARFIELD ST AND LINCOLN ST, MADISON COUNTY, MS	GARFIELD ST / LINCOLN ST CAN	28089030600	1
233	-90.14138°	32.51689°	GLUCKSTADT RD AND C STORE, MADISON COUNTY, MS	GLUCKSTADT RD / C STORE CAN	28089030301	1
234	-90.13148°	32.39951°	EAST COUNTY LINE ROAD AND MOSSLINE DRIVE, MADISON COUNTY, MS	East County Line Road / Mossline Drive	28089030106	1
235	-90.00818°	32.61122°	HWY 16 AND HWY 43, MADISON COUNTY, MS	HWY 16 / HWY 43 CAN	28089030600	1

Compiled Unique Roadblocks

Point ID rid	Longitude lon	Latitude lat	Clean Address clean_address	Original Address original_address	Census Tract ID geoid	Number of Roadblocks num_rbs
236	-90.06335°	32.46814°	OLD RICE RD AND ASPEN DR, MADISON COUNTY, MS	OLD RICE RD / ASPEN DR CAN	28089030201	1
237	-90.11382°	32.41400°	711 LAKE HARBOUR DR, MADISON COUNTY, MS	711 LAKE HARBOUR DR RID	28089030106	1
238	-90.10624°	32.53152°	STRIBLING EXT AND CHURCH, MADISON COUNTY, MS	STRIBLING EXT / CHURCH CAN	28089030400	1
239	-90.31713°	32.58966°	HUNT AVE AND LIVINGSTON VERNON R, MADISON COUNTY, MS	HUNT AVE / LIVINGSTON VERNON R FLO	28089030302	1
240	-89.96975°	32.61860°	E HWY 16 AND ROBINSON RD, MADISON COUNTY, MS	E HWY 16 / ROBINSON RD CAN	28089030900	1
241	-89.75100°	32.76061°	HWY 43 AND MATLOCK RD, MADISON COUNTY, MS	HWY 43 / MATLOCK RD CAN	28089031000	1
242	-89.81078°	32.64797°	ROBINSON RD AND PAT LUCKETT RD, MADISON COUNTY, MS	ROBINSON RD / PAT LUCKETT RD CAN	28089030900	1
243	-90.17900°	32.47503°	N LIVINGSTON RD AND MCDONALD DR, MADISON COUNTY, MS	N LIVINGSTON RD / MCDONALD DR CAN	28089030302	1
244	-90.10638°	32.41825°	OLD CANTON RD AND MRA, MADISON COUNTY, MS	OLD CANTON RD / MRA MAD	28089030104	1
245	-90.05216°	32.62362°	1101 HOLMES AV, MADISON COUNTY, MS	1101 HOLMES AV CAN	28089030500	1
246	-90.10262°	32.40516°	875 WILLIAM BLVD, MADISON COUNTY, MS	875 WILLIAM BLVD RID	28089030108	1
247	-90.20374°	32.40357°	N LIVINGSTON RD AND MARY MYLES RD, MADISON COUNTY, MS	N LIVINGSTON RD / MARY MYLES RD RID	28089030208	1
248	-90.10138°	32.51712°	N. I-55 AND GLUCKSTADT ROAD, MADISON COUNTY, MS	N. I-55/Gluckstadt Road	28089030400	1
249	-90.05374°	32.61559°	112 SUNSET AVE, MADISON COUNTY, MS	112 SUNSET AVE CAN	28089030500	1
250	-90.00686°	32.67412°	HWY 51 AND PISGAH BOTTOM RD, MADISON COUNTY, MS	HWY 51 / PISGAH BOTTOM RD CAN	28089030900	1
251	-90.12696°	32.52344°	STILLHOUSE CREEK DR, MADISON COUNTY, MS	STILLHOUSE CREEK DR CAN	28089030400	1
252	-90.29964°	32.53531°	POCAHONTAS RD AND JEFFREYS RD, MADISON COUNTY, MS	POCAHONTAS RD / JEFFREYS RD FLO	28089030302	1
253	-90.08908°	32.56078°	OLD JACKSON RD AND RAGSDALE RD, MADISON COUNTY, MS	OLD JACKSON RD / RAGSDALE RD MAD	28089030400	1
254	-89.90813°	32.65834°	OLD HWY 16 AND CHURCH LN, MADISON COUNTY, MS	OLD HWY 16 / CHURCH LN CAN	28089030900	1
255	-90.02883°	32.51694°	YANDELL RD AND DEERFIELD BLVD, MADISON COUNTY, MS	YANDELL RD / DEERFIELD BLVD CAN	28089030400	1
256	-89.81422°	32.65004°	HHY 43 AND HWY 17, MADISON COUNTY, MS	HHY 43 / HWY 17 CAN	28089030900	1
257	-90.14667°	32.40387°	HWY 51 AND I-55, MADISON COUNTY, MS	HWY 51 / I-55 RID	28089030105	1
258	-90.10635°	32.42144°	OLD CANTON RD AND RICE RD, MADISON COUNTY, MS	OLD CANTON RD / RICE RD RID	28089030107	1
259	-90.19897°	32.42370°	N LIVINGSTON RD AND ROUSER RD, MADISON COUNTY, MS	N LIVINGSTON RD / ROUSER RD RID	28089030205	1
260	-90.05459°	32.64026°	GREEN ACRES AND KING RANCH, MADISON COUNTY, MS	GREEN ACRES / KING RANCH CAN	28089030500	1
261	-89.73889°	32.69439°	E HWY 16 AND PERMENTER RD, MADISON COUNTY, MS	E HWY 16 / PERMENTER RD CAN	28089030900	1
262	-90.00299°	32.61638°	COVINGTON DR AND HWY 43, MADISON COUNTY, MS	COVINGTON DR / HWY 43 CAN	28089030600	1
263	-90.03262°	32.63559°	W HWY 16 AND OIL MILL QUARTERS RD, MADISON COUNTY, MS	W HWY 16 / OIL MILL QUARTERS RD CAN	28089030600	1
264	-90.34346°	32.52296°	W HWY 22, MADISON COUNTY, MS	W HWY 22 CAN	28089030302	1
265	-90.03489°	32.61513°	HWY 51 AND N MAD, MADISON COUNTY, MS	HWY 51 / N MAD CAN	28089030600	1
266	-90.04753°	32.61673°	349 WELCH ST, MADISON COUNTY, MS	349 WELCH ST CAN	28089030500	1
267	-90.18817°	32.51525°	HWY 463 AND REUNION BLVD, MADISON COUNTY, MS	HWY 463 / REUNION BLVD MAD	28089030301	1
268	-90.14445°	32.51688°	GLUCKSTADT RD AND KRISTEN HILL RD, MADISON COUNTY, MS	GLUCKSTADT RD / KRISTEN HILL RD CAN	28089030400	1
269	-90.05065°	32.61748°	390 RICKS DR, MADISON COUNTY, MS	390 RICKS DR CAN	28089030500	1
270	-89.93042°	32.78058°	LORING RD AND TUCKER RD, MADISON COUNTY, MS	LORING RD / TUCKER RD CAN	28089031000	1
271	-90.03503°	32.63808°	CMUANDRAILROAD, MADISON COUNTY, MS	CMU/RAILROAD CAN	28089030600	1
272	-90.16140°	32.43008°	OLD AGENCY RD AND DINSMOR CRSG, MADISON COUNTY, MS	OLD AGENCY RD / DINSMOR CRSG RID	28089030206	1
273	-90.08551°	32.51169°	HWY 51 AND YANDELL RD, MADISON COUNTY, MS	HWY 51 / YANDELL RD CAN	28089030400	1
274	-90.04385°	32.61013°	W ACADEMY ST AND S WALNUT ST, MADISON COUNTY, MS	W ACADEMY ST / S WALNUT ST CAN	28089030500	1
275	-90.30622°	32.53867°	POCAHONTAS RD AND WATSON ST, MADISON COUNTY, MS	POCAHONTAS RD / WATSON ST CAN	28089030302	1
276	-90.05491°	32.47240°	OLD RICE RD AND MADI, MADISON COUNTY, MS	OLD RICE RD / MADI CAN	28089030201	1
277	-90.01125°	32.74899°	WAY RD AND GRAY CENTER RD, MADISON COUNTY, MS	WAY RD / GRAY CENTER RD CAN	28089031000	1
278	-90.08907°	32.56426°	OLD JACKSON RD AND HILL RD, MADISON COUNTY, MS	OLD JACKSON RD / HILL RD CAN	28089030400	1
279	-90.04050°	32.60405°	TROLIO ST AND W DINKINS ST, MADISON COUNTY, MS	TROLIO ST / W DINKINS ST CAN	28089030700	1
280	-90.31698°	32.58353°	KEARNEY PARK RD AND MRS ST, MADISON COUNTY, MS	KEARNEY PARK RD / MRS ST CAN	28089030302	1
281	-90.21386°	32.46539°	LAKE CAVALIER ROAD AND SUNSET LANE, MADISON COUNTY, MS	Lake Cavalier Road / Sunset lane	28089030302	1
282	-90.04239°	32.60974°	S CANAL ST AND APPT COMPLEX, MADISON COUNTY, MS	S CANAL ST / APPT COMPLEX CAN	28089030500	1

Compiled Unique Roadblocks

Point ID rid	Longitude lon	Latitude lat	Clean Address clean_address	Original Address original_address	Census Tract ID geoid	Number of Roadblocks num_rbs
283	-90.13632°	32.53750°	CATLETT RD AND STRIBLING RD, MADISON COUNTY, MS	CATLETT RD / STRIBLING RD CAN	28089030400	1
284	-90.26086°	32.49780°	ROBINSON SPRINGS RD AND ROBINSON, MADISON COUNTY, MS	ROBINSON SPRINGS RD / ROBINSON CAN	28089030302	1
285	-90.14391°	32.43605°	I-55 S AND RIDGELAND, MADISON COUNTY, MS	I-55 S / RIDGELAND CAN	28089030101	1
286	-90.04675°	32.61556°	BOYD ST, MADISON COUNTY, MS	Boyd St	28089030500	1
287	-90.08698°	32.41514°	BREAKERS LN, MADISON COUNTY, MS	BREAKERS LN CAN	28089030107	1
288	-90.04016°	32.49513°	TWELVE OAKS RD AND OLD CANTON RD, MADISON COUNTY, MS	TWELVE OAKS RD / OLD CANTON RD CAN	28089030201	1
289	-90.03969°	32.64034°	GREEN ACRES DR AND HWY 16W, MADISON COUNTY, MS	GREEN ACRES DR / HWY 16W CAN	28089030500	1
290	-90.13886°	32.54157°	TYLER LN AND CATLETT RD, MADISON COUNTY, MS	TYLER LN / CATLETT RD CAN	28089030400	1
291	-90.20355°	32.40807°	LIVINGSTON RD AND PEATRY PENDLETON, MADISON COUNTY, MS	LIVINGSTON RD / PEATRY PENDLETON RID	28089030206	1
292	-90.03133°	32.51893°	43 AND YANDELL RD, MADISON COUNTY, MS	43 / YANDELL RD CAN	28089030400	1
293	-90.05483°	32.61848°	KING RANCH RD AND GEORGE WASHINGTON AVE, MADISON COUNTY, MS	KING RANCH RD / GEORGE WASHINGTON AVE CAN	28089030500	1
294	-90.15555°	32.43023°	NATCHEZ TRACE AND GREENWOOD XING, MADISON COUNTY, MS	NATCHEZ TRACE / GREENWOOD XING RID	28089030206	1
295	-89.99463°	32.61118°	E HWY 16 AND COUNTRY CLUB DR, MADISON COUNTY, MS	E HWY 16 / COUNTRY CLUB DR CAN	28089030800	1
296	-89.93830°	32.78063°	LORING RD AND HARGON RD, MADISON COUNTY, MS	LORING RD / HARGON RD CAN	28089031000	1
297	-90.03336°	32.74445°	WAY RD AND WAY CIR, MADISON COUNTY, MS	WAY RD / WAY CIR CAN	28089031000	1
298	-90.10635°	32.43982°	RIDGECREST DR AND OLD CANTON RD, MADISON COUNTY, MS	RIDGECREST DR / OLD CANTON RD MAD	28089030101	1
299	-90.04935°	32.61853°	MACE STREET AND GEORGE WASHINGTON ST, MADISON COUNTY, MS	Mace Street / George Washington St	28089030500	1
300	-89.94203°	32.85523°	HWY 17 AND OLD 51 RD, MADISON COUNTY, MS	HWY 17 / OLD 51 RD PIC	28089031000	1
301	-90.11235°	32.40999°	NORTH PARK DR AND FONTAINE PL, MADISON COUNTY, MS	NORTH PARK DR / FONTAINE PL CAN	28089030106	1
302	-90.11094°	32.46031°	YANDELL AND MADISON CROSSING, MADISON COUNTY, MS	YANDELL / MADISON CROSSING CAN	28089030202	1
303	-90.14668°	32.53369°	SYCAMORE RIDGE AND ASHBROOKE BLV, MADISON COUNTY, MS	SYCAMORE RIDGE / ASHBROOKE BLV CAN	28089030400	1
304	-90.00198°	32.61001°	PEACE ST, MADISON COUNTY, MS	PEACE ST CAN	28089030600	1
305	-90.33811°	32.55318°	COX FERRY RD AND OLD HWY 49, MADISON COUNTY, MS	COX FERRY RD / OLD HWY 49 FLO	28089030302	1
306	-90.03286°	32.63661°	HWY 16 AND OIL MILL QUARTERS RD, MADISON COUNTY, MS	HWY 16 / OIL MILL QUARTERS RD CAN	28089030600	1
307	-90.31290°	32.54469°	FIRST ST AND CENTER ST, MADISON COUNTY, MS	FIRST ST / CENTER ST FLO	28089030302	1
308	-89.99718°	32.58401°	1528 HWY 43, MADISON COUNTY, MS	1528 HWY 43 CAN	28089030900	1
309	-90.04543°	32.61137°	ROBY ST AND W FULTON ST, MADISON COUNTY, MS	ROBY ST / W FULTON ST CAN	28089030500	1
310	-90.09484°	32.51365°	WEISENBERGER ROAD AND PARKWAY EAST, MADISON COUNTY, MS	Weisenberger Road / Parkway East	28089030204	1
311	-90.04283°	32.60405°	W DINKINS ST AND RANGE, MADISON COUNTY, MS	W DINKINS ST / RANGE CAN	28089030700	1
312	-90.05379°	32.62360°	HOLMES AVENUE AND WAYNE DRIVE, MADISON COUNTY, MS	Holmes Avenue/Wayne Drive	28089030500	1
313	-90.02437°	32.62048°	MILLER ST AND LINCOLN ST, MADISON COUNTY, MS	MILLER ST / LINCOLN ST CAN	28089030600	1
314	-89.79151°	32.75230°	HWY 43 AND HONEYSUCKER RD, MADISON COUNTY, MS	HWY 43 / HONEYSUCKER RD CAN	28089031000	1
315	-90.11850°	32.46476°	MADISON PARKWAY AND POST OAK RD, MADISON COUNTY, MS	MADISON PARKWAY / POST OAK RD MAD	28089030203	1
316	-90.09157°	32.49991°	1556 HWY 51, MADISON COUNTY, MS	1556 HWY 51 MAD	28089030201	1
317	-90.05488°	32.47242°	OLD RICE RD AND CHANNEL LN, MADISON COUNTY, MS	OLD RICE RD / CHANNEL LN MAD	28089030201	1
318	-90.31023°	32.54490°	111 KEARNEY PARK RD, MADISON COUNTY, MS	111 KEARNEY PARK RD FLO	28089030302	1
319	-90.05585°	32.47233°	OLD RICE AND HALEY CREEK, MADISON COUNTY, MS	OLD RICE / HALEY CREEK CAN	28089030201	1
320	-90.04889°	32.62275°	1006 HOLMES AV, MADISON COUNTY, MS	1006 HOLMES AV CAN	28089030500	1
321	-89.98647°	32.61325°	HWY 16 AND GREENFIELD DR, MADISON COUNTY, MS	HWY 16 / GREENFIELD DR CAN	28089030900	1
322	-90.10094°	32.48181°	HWY 51 AND TISDALE RD, MADISON COUNTY, MS	HWY 51 / TISDALE RD MAD	28089030203	1
323	-90.08110°	32.56065°	NISSAN AND I-55, MADISON COUNTY, MS	NISSAN / I-55 CAN	28089030400	1
324	-90.03939°	32.60659°	CAMERON ST AND LEE ST, MADISON COUNTY, MS	CAMERON ST / LEE ST CAN	28089030700	1
325	-90.09635°	32.42126°	RICE RD AND HARBOR DR, MADISON COUNTY, MS	RICE RD / HARBOR DR CAN	28089030107	1
326	-90.05480°	32.62393°	KING RANCH AND PARKVIEW, MADISON COUNTY, MS	KING RANCH / PARKVIEW CAN	28089030500	1
327	-90.07202°	32.46506°	HOY RD AND N OLD CANTON RD, MADISON COUNTY, MS	HOY RD / N OLD CANTON RD CAN	28089030201	1
328	-90.06374°	32.55366°	HIGHWAY 51 AND SOUTH LIBERTY, MADISON COUNTY, MS	Highway 51 / South Liberty	28089030400	1
329	-89.83846°	32.78040°	HWY 17 AND MCCARTY RD, MADISON COUNTY, MS	HWY 17 / MCCARTY RD CAM	28089031000	1

Compiled Unique Roadblocks

Point ID <i>rid</i>	Longitude <i>lon</i>	Latitude <i>lat</i>	Clean Address <i>clean_address</i>	Original Address <i>original_address</i>	Census Tract ID <i>geoid</i>	Number of Roadblocks <i>num_rbs</i>
330	-90 32426°	32 59968°	LIVINGSTON VERNON AND ST CHARLE, MADISON COUNTY, MS	LIVINGSTON VERNON / ST CHARLE CAN	28089030302	1
331	-90 31217°	32 55143°	KEARNEY PARK RD AND COURT ST, MADISON COUNTY, MS	KEARNEY PARK RD / COURT ST FLO	28089030302	1
332	-90 04385°	32 61134°	WALNUT ST AND W FULTON ST, MADISON COUNTY, MS	WALNUT ST / W FULTON ST CAN	28089030500	1
333	-89 87865°	32 62209°	ROBINSON RD AND PLEASANT GIFT RD, MADISON COUNTY, MS	ROBINSON RD / PLEASANT GIFT RD CAN	28089030900	1
334	-90 11325°	32 45780°	HWY 51 AND MADISON AVE, MADISON COUNTY, MS	HWY 51 / MADISON AVE CAN	28089030203	1
335	-90 10721°	32 46508°	HOY RD AND OLD CANTON RD, MADISON COUNTY, MS	HOY RD / OLD CANTON RD CAN	28089030202	1
336	-89 93550°	32 64578°	1400 SHARON RD, MADISON COUNTY, MS	1400 SHARON RD CAN	28089030900	1
337	-90 17773°	32 53680°	103 N I-55, MADISON COUNTY, MS	103 N I-55 RID	28089030400	1
338	-90 32935°	32 58968°	LIVINGSTON VERNON RD AND EMMIT R, MADISON COUNTY, MS	LIVINGSTON VERNON RD / EMMIT R CAN	28089030302	1
339	-89 98319°	32 65553°	GOODLOE RD HWY 43, MADISON COUNTY, MS	GOODLOE RD HWY 43 CAN	28089030900	1
340	-89 93564°	32 65857°	HWY 43 AND GOO, MADISON COUNTY, MS	HWY 43 / GOO CAN	28089030900	1
341	-90 13520°	32 54155°	TYLER LN AND CAT, MADISON COUNTY, MS	TYLER LN / CAT CAN	28089030400	1
342	-90 04442°	32 58665°	2941 HWY 51, MADISON COUNTY, MS	2941 HWY 51 CAN	28089030400	1
343	-90 08921°	32 53161°	CHURCH RD AND OLD JACKSON RD, MADISON COUNTY, MS	CHURCH RD / OLD JACKSON RD CAN	28089030400	1
344	-90 01306°	32 51686°	YANDELL RD AND BAINBRIDGE CROSSI, MADISON COUNTY, MS	YANDELL RD / BAINBRIDGE CROSSI MAD	28089030900	1
345	-90 11871°	32 46293°	MAIN ST AND POST OAK RD, MADISON COUNTY, MS	MAIN ST / POST OAK RD CAN	28089030203	1
346	-90 09119°	32 52016°	N INDUSTRIAL BLVD, MADISON COUNTY, MS	N INDUSTRIAL BLVD CAN	28089030400	1
347	-90 10640°	32 42712°	OLD CANTON RD AND NATCHEZ TRACE, MADISON COUNTY, MS	OLD CANTON RD / NATCHEZ TRACE RID	28089030101	1
348	-90 31714°	32 58966°	KEARNEY PARK AND LIVINGSTON VERNON, MADISON COUNTY, MS	KEARNEY PARK / LIVINGSTON VERNON CAN	28089030302	1
349	-90 15925°	32 68291°	HWY 22 AND PANTHER CREEK, MADISON COUNTY, MS	HWY 22 / PANTHER CREEK CAN	28089030400	1
350	-90 08528°	32 68191°	WILLIAMS BLVD, MADISON COUNTY, MS	WILLIAMS BLVD CAN	28089030400	1
351	-90 22227°	32 49411°	ROBINSON SPRING RD AND COKER RD, MADISON COUNTY, MS	ROBINSON SPRING RD / COKER RD CAN	28089030302	1
352	-90 10136°	32 40217°	PINE KNOLL CT, MADISON COUNTY, MS	PINE KNOLL CT RID	28089030108	1
353	-90 01058°	32 61731°	COVINGTON DRIVE AND CISNE AVE, MADISON COUNTY, MS	Covington Drive / Cisne Ave	28089030800	1
354	-90 04871°	32 61298°	108 BOYD STREET, MADISON COUNTY, MS	108 Boyd Street	28089030500	1
355	-89 96806°	32 64185°	HWY 43 AND QUAIL RD, MADISON COUNTY, MS	HWY 43 / QUAIL RD CAN	28089030900	1
356	-90 09279°	32 49782°	HWY 51 AND GROSS RD, MADISON COUNTY, MS	HWY 51 / GROSS RD MAD	28089030204	1
357	-90 30010°	32 56464°	HARRIS RD AND HARRIS SUBDIVISION, MADISON COUNTY, MS	HARRIS RD / HARRIS SUBDIVISION FLO	28089030302	1
358	-90 07841°	32 60265°	HWY 22 AND VIRLILIA RD, MADISON COUNTY, MS	HWY 22 / VIRLILIA RD CAN	28089030400	1
359	-90 17763°	32 42745°	OLD AGENCY RD AND PATTERSON, MADISON COUNTY, MS	OLD AGENCY RD / PATTERSON CAN	28089030205	1
360	-89 93050°	32 65864°	OLD HWY 16 AND ROBERT DEARON RD, MADISON COUNTY, MS	OLD HWY 16 / ROBERT DEARON RD CAN	28089030900	1
361	-90 03488°	32 61856°	UNION ST AND LIBERTY ST, MADISON COUNTY, MS	UNION ST / LIBERTY ST CAN	28089030600	1

Source: Funderburk Report, Appendix D

Appendix D1

Near Analysis

Genus Tract ID within 20 Meters of the Road Block	Genus Tract ID Assigned by Dr. Ricchetti	Point ID	Longitude	Latitude	Number of Roadblocks	Near Distance (Meters) ⁽¹⁾	Near Rank ⁽²⁾	Percent Black Population for Census Tract Assigned by Dr. Ricchetti	Percent Black Population for Census Tract within 20 Meters of the Road Block	Max Percent Black Population of All Tracts within 20 Meters of the Road Block	Min Percent Black Population of All Tracts within 20 Meters of the Road Block	Could be More Black ⁽³⁾ could be moreblack	Could be Less Black ⁽⁴⁾ could be lessblack	Number of Roadblocks Could be More Black ⁽⁵⁾ num_rbs_could be_more_black	Number of Roadblocks Could be Less Black ⁽⁶⁾ num_rbs_could be_less_black
near_geoid	rb_geoid	rid	lon	lat	num_rbs	NEAR_DIST	NEAR_RANK	rb_pctblack	near_pctblack	max_pctblack	min_pctblack				
28089030101	28089030101	141	-90.12996°	32.42631°	2	0.00	1	10.7%	10.7%	46.2%	10.7%	1	0	2	0
28089030101	28089030101	194	-90.11701°	32.45051°	1	0.00	1	10.7%	10.7%	11.6%	10.7%	1	0	1	0
28089030101	28089030101	347	-90.10640°	32.42712°	1	0.00	1	10.7%	10.7%	18.0%	10.7%	1	0	1	0
28089030101	28089030101	188	-90.10644°	32.45044°	1	0.00	1	10.7%	10.7%	10.9%	10.7%	1	0	1	0
28089030104	28089030104	77	-90.10902°	32.41405°	5	0.00	1	16.5%	16.5%	47.6%	16.5%	1	0	5	0
28089030104	28089030104	67	-90.12352°	32.42500°	6	0.00	1	16.5%	16.5%	46.2%	16.5%	1	0	6	0
28089030104	28089030104	244	-90.10638°	32.41625°	1	0.00	1	16.5%	16.5%	18.0%	16.5%	1	0	1	0
28089030105	28089030105	59	-90.14375°	32.42818°	7	0.00	1	46.2%	46.2%	46.2%	10.7%	0	1	0	7
28089030106	28089030106	237	-90.11382°	32.41400°	1	0.00	1	47.6%	47.6%	47.6%	16.5%	0	1	0	1
28089030106	28089030106	4	-90.10804°	32.40255°	59	0.00	1	47.6%	47.6%	65.6%	47.6%	1	0	59	0
28089030106	28089030106	20	-90.10651°	32.40515°	19	0.00	1	47.6%	47.6%	65.6%	47.6%	1	0	19	0
28089030106	28089030106	234	-90.13148°	32.39951°	1	0.00	1	47.6%	47.6%	47.6%	47.6%	0	0	0	0
28089030106	28089030106	25	-90.13207°	32.40682°	17	0.00	1	47.6%	47.6%	47.6%	46.2%	0	1	0	17
28089030106	28089030106	22	-90.10635°	32.41099°	18	0.00	1	47.6%	47.6%	65.6%	47.6%	1	0	18	0
28089030107	28089030107	3	-90.08861°	32.41169°	65	0.53	2	18.0%	18.0%	65.6%	18.0%	1	0	65	0
28089030107	28089030107	18	-90.09314°	32.41200°	20	0.00	1	18.0%	18.0%	65.6%	18.0%	1	0	20	0
28089030107	28089030107	258	-90.10635°	32.42144°	1	0.00	1	18.0%	18.0%	18.0%	16.5%	0	1	0	1
28089030108	28089030108	110	-90.10625°	32.41099°	4	0.00	1	65.6%	65.6%	65.6%	47.6%	0	1	0	4
28089030108	28089030108	53	-90.08884°	32.41167°	8	0.00	1	65.6%	65.6%	65.6%	18.0%	1	0	25	0
28089030201	28089030201	14	-89.97501°	32.52461°	25	0.00	1	18.6%	18.6%	69.5%	18.6%	1	0	1	0
28089030201	28089030201	203	-89.97251°	32.52276°	1	0.00	1	18.6%	18.6%	18.6%	18.6%	1	0	1	0
28089030201	28089030201	49	-89.97754°	32.52706°	9	0.00	1	18.6%	18.6%	69.5%	18.6%	1	0	8	0
28089030201	28089030201	316	-90.09157°	32.49991°	1	0.00	1	18.6%	18.6%	18.6%	14.7%	0	1	0	1
28089030201	28089030201	51	-89.98343°	32.51694°	8	0.00	1	18.6%	18.6%	69.5%	18.6%	1	0	8	0
28089030202	28089030202	113	-90.09117°	32.46505°	3	0.00	1	10.9%	10.9%	18.6%	10.9%	1	0	3	0
28089030203	28089030203	334	-90.11325°	32.45780°	1	0.00	1	11.6%	11.6%	11.6%	10.9%	0	1	0	1
28089030203	28089030203	122	-90.10952°	32.46509°	3	0.36	2	11.6%	11.6%	11.6%	10.9%	0	1	0	3
28089030203	28089030203	322	-90.10094°	32.48181°	1	0.00	1	11.6%	11.6%	18.6%	11.6%	1	0	1	0
28089030204	28089030204	108	-90.09547°	32.49241°	4	0.31	2	14.7%	14.7%	18.6%	14.7%	1	0	4	0
28089030204	28089030204	17	-90.17293°	32.45587°	21	0.00	1	14.7%	14.7%	17.9%	14.7%	1	0	21	0
28089030204	28089030204	356	-90.09279°	32.49762°	1	0.00	1	14.7%	14.7%	18.6%	14.7%	1	0	1	0
28089030205	28089030205	359	-90.17763°	32.42745°	1	0.00	1	17.9%	17.9%	17.9%	13.0%	0	1	0	1
28089030205	28089030205	259	-90.19697°	32.42370°	1	0.00	1	17.9%	17.9%	49.3%	13.0%	1	1	1	1
28089030206	28089030206	139	-90.20283°	32.40014°	2	0.69	1	13.0%	13.0%	13.0%	13.0%	0	0	0	0
28089030206	28089030206	39	-90.17659°	32.40026°	11	0.00	1	13.0%	13.0%	46.2%	13.0%	1	0	11	0
28089030206	28089030206	37	-90.19989°	32.42081°	11	0.00	1	13.0%	13.0%	17.9%	13.0%	1	0	11	0
28089030206	28089030206	101	-90.18200°	32.40020°	4	0.37	1	13.0%	13.0%	13.0%	13.0%	0	0	0	0
28089030206	28089030206	154	-90.19946°	32.42228°	2	0.00	1	13.0%	13.0%	17.9%	13.0%	1	0	2	0
28089030206	28089030206	1	-90.17708°	32.40025°	114	0.00	1	13.0%	13.0%	13.0%	13.0%	0	0	0	0
28089030301	28089030301	80	-90.15769°	32.51791°	5	0.00	1	11.6%	11.6%	28.0%	11.6%	1	0	5	0
28089030301	28089030301	33	-90.19194°	32.52423°	12	0.00	1	11.6%	11.6%	28.0%	11.6%	1	0	12	0
28089030301	28089030301	233	-90.14138°	32.51689°	1	0.00	1	11.6%	11.6%	28.0%	11.6%	1	0	1	0
28089030301	28089030301	177	-90.13915°	32.49762°	2	0.00	1	11.6%	11.6%	14.7%	11.6%	1	0	2	0
28089030301	28089030301	196	-90.16147°	32.51903°	1	0.00	1	11.6%	11.6%	28.0%	11.6%	1	0	1	0
28089030302	28089030302	189	-90.19880°	32.43164°	1	0.00	1	49.3%	49.3%	49.3%	17.9%	0	1	0	1
28089030302	28089030302	119	-90.20074°	32.48393°	3	0.00	1	49.3%	49.3%	49.3%	11.6%	0	1	0	3
28089030302	28089030302	50	-90.24606°	32.50652°	8	0.25	2	49.3%	49.3%	49.3%	28.0%	0	1	0	8
28089030302	28089030302	43	-90.18657°	32.45495°	10	0.00	1	49.3%	49.3%	49.3%	14.7%	0	1	0	10
28089030302	28089030302	243	-90.17800°	32.47503°	1	0.00	1	49.3%	49.3%	49.3%	14.7%	0	1	0	1
28089030302	28089030302	64	-90.20086°	32.44432°	7	0.00	1	49.3%	49.3%	49.3%	17.9%	0	1	0	7
28089030400	28089030400	100	-90.07054°	32.51711°	4	0.00	1	28.0%	28.0%	28.0%	18.6%	0	1	0	4
28089030400	28089030400	127	-90.07058°	32.51712°	3	0.00	1	28.0%	28.0%	28.0%	18.6%	0	1	0	3
28089030400	28089030400	246	-90.10138°	32.51712°	1	0.00	1	28.0%	28.0%	28.0%	14.7%	0	1	0	1
28089030400	28089030400	151	-90.07205°	32.51708°	2	0.09	2	28.0%	28.0%	28.0%	18.6%	0	1	0	2

Near Analysis

Census Tract ID within 20 Meters of the Road Block	Census Tract ID Assigned by Dr. Ricchetti	Point ID	Longitude	Latitude	Number of Roadblocks	Near Distance (Meters) ^[1]	Near Rank ^[2]	Percent Black Population for Census Tract Assigned by Dr. Ricchetti	Percent Black Population for Census Tract within 20 Meters of the Road Block	Max Percent Black Population of All Tracts within 20 Meters of the Road Block	Min Percent Black Population of All Tracts within 20 Meters of the Road Block	Could be More Black ^[3] could_be moreblack	Could be Less Black ^[4] could_be lessblack	Number of Roadblocks Could be More Black ^[5] num_rbs_could be_more_black	Number of Roadblocks Could be Less Black ^[6] num_rbs_could be_less_black
near_geoid	rb_geoid	rid	lon	lat	num_rbs	NEAR_DIST	NEAR_RANK	rb_pctblack	near_pctblack	max_pctblack	min_pctblack				
28089030400	28089030400	268	-90.14445°	32.51688°	1	0.47	2	28.0%	28.0%	28.0%	11.6%	0	1	0	1
28089030400	28089030400	273	-90.08551°	32.51169°	1	0.07	2	28.0%	28.0%	28.0%	14.7%	0	1	0	1
28089030400	28089030400	98	-90.07178°	32.51710°	4	0.00	1	28.0%	28.0%	28.0%	18.6%	0	1	0	4
28089030400	28089030400	255	-90.02883°	32.51694°	1	0.16	2	28.0%	28.0%	28.0%	18.6%	0	1	0	1
28089030400	28089030400	161	-90.07616°	32.51581°	2	0.00	1	28.0%	28.0%	28.0%	18.6%	0	1	0	2
28089030400	28089030400	89	-90.13200°	32.51692°	4	0.00	1	28.0%	28.0%	28.0%	11.6%	0	1	0	4
28089030400	28089030400	292	-90.03133°	32.51693°	1	0.00	1	28.0%	28.0%	28.0%	18.6%	0	1	0	1
28089030500	28089030500	211	-90.05476°	32.63267°	1	0.00	1	89.5%	89.5%	89.5%	28.0%	0	1	0	1
28089030500	28089030600	289	-90.03969°	32.64034°	1	0.00	1	89.5%	89.5%	89.5%	28.0%	0	1	0	1
28089030500	28089030500	260	-90.05459°	32.64026°	1	0.00	1	89.5%	89.5%	89.5%	28.0%	0	1	0	1
28089030500	28089030500	72	-90.03846°	32.62370°	6	0.00	1	89.5%	89.5%	89.5%	83.7%	0	1	0	6
28089030500	28089030500	11	-90.03488°	32.64034°	32	0.00	1	89.5%	89.5%	89.5%	28.0%	0	1	0	32
28089030600	28089030600	157	-89.96033°	32.62187°	2	0.00	1	83.7%	83.7%	83.7%	69.5%	0	1	0	2
28089030600	28089030600	304	-90.00198°	32.61001°	1	0.00	1	83.7%	83.7%	83.7%	59.6%	0	1	0	1
28089030600	28089030600	236	-90.00818°	32.61122°	1	0.14	2	83.7%	83.7%	83.7%	59.6%	0	1	0	1
28089030600	28089030600	8	-90.03373°	32.64035°	38	0.00	1	83.7%	83.7%	83.7%	69.5%	0	1	0	38
28089030600	28089030600	116	-90.01183°	32.63320°	3	0.00	1	83.7%	83.7%	83.7%	69.5%	0	1	0	3
28089030600	28089030600	271	-90.03503°	32.63908°	1	0.00	1	83.7%	83.7%	83.7%	69.5%	0	1	0	1
28089030600	28089030600	19	-89.98714°	32.61306°	19	0.57	2	83.7%	83.7%	83.7%	59.6%	0	1	0	19
28089030700	28089030700	166	-90.03491°	32.60404°	2	0.00	1	58.4%	58.4%	59.6%	58.4%	1	0	2	0
28089030800	28089030800	295	-89.99463°	32.61118°	1	0.00	1	69.6%	69.6%	83.7%	69.6%	1	0	1	0
28089030800	28089030800	158	-90.02995°	32.61016°	2	0.00	1	59.6%	59.6%	59.6%	58.4%	0	1	0	2
28089030900	28089030900	321	-89.98647°	32.61325°	1	0.00	1	69.5%	69.5%	83.7%	69.5%	1	1	1	1
28089030900	28089030900	107	-89.76598°	32.74020°	4	0.00	1	69.5%	69.5%	84.0%	69.5%	1	0	4	0
28089030900	28089030900	240	-89.96975°	32.61860°	1	0.00	1	69.5%	69.5%	83.7%	69.5%	1	0	1	0
28089030900	28089030900	124	-89.96964°	32.52200°	3	0.00	1	69.5%	69.5%	69.5%	18.6%	0	1	0	3
28089030900	28089030900	344	-90.01308°	32.51886°	1	0.00	1	69.5%	69.5%	69.5%	18.6%	0	1	0	1
28089031000	28089031000	85	-89.80946°	32.71561°	5	0.00	1	84.0%	84.0%	84.0%	69.5%	0	1	0	5

Source: Funderburk Report, Appendix D; Mississippi Transverse Mercator NAD83 Projection; Madison County Census Tract Polygon Data

Note:

[1] The distance in meters returned by the Near Analysis between the road block point and the nearest boundary of the Census Tract. 0 referenced by the "Census Tract. D within 20 Meters of the Road Block." This value is between zero (indicating the point is in the poly) and 20 meters

[2] If more than one Census Tract is within 20 meters of the road block point, the rank indicates the order in which they are closest (the closest being 1)

[3] A value of 1 if the "Percent Black Population for Census Tract Assigned by Dr. Ricchetti" is less than the "Max Percent Black Population of All Tracts within 20 Meters of the Road Block."

[4] A value of 1 if the "Percent Black Population for Census Tract Assigned by Dr. Ricchetti" is more than the "Min Percent Black Population of All Tracts within 20 Meters of the Road Block."

[5] The "Number of Roadblocks" times the value of "Could be More Black."

[6] The "Number of Roadblocks" times the value of "Could be Less Black."

Appendix D2

Near Analysis

Point ID <i>rid</i>	Clean Address <i>clean_addr</i>
141	HWY 51 AND NATCHEZ TRACE, MADISON COUNTY, MS
194	HWY 51 AND ST AUGUSTINE DR, MADISON COUNTY, MS
347	OLD CANTON RD AND NATCHEZ TRACE, MADISON COUNTY, MS
188	OLD CANTON RD AND ST AUGUSTINE D, MADISON COUNTY, MS
77	LAKE HARBOUR DRIVE AND RANKIN, MADISON COUNTY, MS
67	RICE RD AND PEAR ORCHARD RD, MADISON COUNTY, MS
244	OLD CANTON RD AND MRA, MADISON COUNTY, MS
59	NATCHEZ TRACE PKWY AND I-55, MADISON COUNTY, MS
237	711 LAKE HARBOUR DR, MADISON COUNTY, MS
4	OLD CANTON RD AND PINE KNOLL DR, MADISON COUNTY, MS
20	OLD CANTON RD AND WILLIAM BLVD, MADISON COUNTY, MS
234	EAST COUNTY LINE ROAD AND MOSSLINE DRIVE, MADISON COUNTY, MS
25	TOWNE CENTER AND WHEATLEY, MADISON COUNTY, MS
22	HARBOUR PT XING AND OLD CANTON, MADISON COUNTY, MS
3	LOWER SPILLWAY RD, MADISON COUNTY, MS
18	HARBOR AND LAKE HARBOR, MADISON COUNTY, MS
258	OLD CANTON RD AND RICE RD, MADISON COUNTY, MS
110	HARBOUR POINTE CROSSING AND NORT, MADISON COUNTY, MS
53	SPILLWAY RD AND BREAKERS LN, MADISON COUNTY, MS
14	HWY 43 AND NATCHEZ TRACE PKWY, MADISON COUNTY, MS
203	HWY 43 AND BROWNS LANDING RD, MADISON COUNTY, MS
49	HWY 43 AND YANDELL RD, MADISON COUNTY, MS
316	1556 HWY 51, MADISON COUNTY, MS
51	YANDELL RD AND TWELVE OAKS TRACE, MADISON COUNTY, MS
113	HOY RD AND RICE RD, MADISON COUNTY, MS
334	HWY 51 AND MADISON AVE, MADISON COUNTY, MS
122	HWY 463 AND MADISON MIDDLE, MADISON COUNTY, MS
322	HWY 51 AND TISDALE RD, MADISON COUNTY, MS
108	HWY 51 AND GREEN OAK LN, MADISON COUNTY, MS
17	LAKE CASTLE RD AND RICHARDSON RD, MADISON COUNTY, MS
356	HWY 51 AND GROSS RD, MADISON COUNTY, MS
359	OLD AGENCY RD AND PATTERSON, MADISON COUNTY, MS
259	N LIVINGSTON RD AND ROUSER RD, MADISON COUNTY, MS
139	N LIVINGSTON RD AND COUNTY LINE, MADISON COUNTY, MS
39	I-220 AND W COUNTY LINE RD, MADISON COUNTY, MS
37	LIVINGSTON RD AND OLD AGENCY RD, MADISON COUNTY, MS
101	W COUNTY LINE AND HIGHLAND COLONY, MADISON COUNTY, MS
154	N LIVINGSTON RD AND NATCHEZ TRACE BRIDGE, MADISON COUNTY, MS
1	W COUNTY LINE RD AND I-220, MADISON COUNTY, MS
80	GLUCKSTADT RD AND DEWEES RD, MADISON COUNTY, MS
33	HWY 463 AND GLUCKSTADT RD, MADISON COUNTY, MS
233	GLUCKSTADT RD AND C STORE, MADISON COUNTY, MS
177	BOZEMAN RD AND REUNION ANNANDALE, MADISON COUNTY, MS
196	463 AND GLUCKSTADT RD, MADISON COUNTY, MS
189	N LIVINGSTON RD AND COU, MADISON COUNTY, MS
118	ROBINSON SPRINGS RD AND POC, MADISON COUNTY, MS
50	LIVINGSTON VERNON RD AND STOKES, MADISON COUNTY, MS
43	N LIVINGSTON RD AND LAKE CASTLE RD, MADISON COUNTY, MS
243	N LIVINGSTON RD AND MCDONALD DR, MADISON COUNTY, MS

Near Analysis

Point ID <i>rid</i>	Clean Address <i>clean_addr</i>
64	LAKE CAVALIER RD AND N LIVINGSTO, MADISON COUNTY, MS
100	YANDELL RD AND MADISON CROSSING, MADISON COUNTY, MS
127	300 YANDELL RD, MADISON COUNTY, MS
248	N. I-55 AND GLUCKSTADT ROAD, MADISON COUNTY, MS
151	YANDELL RD AND BRACEY RD, MADISON COUNTY, MS
268	GLUCKSTADT RD AND KRISTEN HILL RD, MADISON COUNTY, MS
273	HWY 51 AND YANDELL RD, MADISON COUNTY, MS
98	YANDELL RD AND CLARKDELL RD, MADISON COUNTY, MS
255	YANDELL RD AND DEERFIELD BLVD, MADISON COUNTY, MS
161	YANDELL RD AND CLARKDELL RD EXT, MADISON COUNTY, MS
89	GLUCKSTADT RD AND CATLETT RD, MADISON COUNTY, MS
292	43 AND YANDELL RD, MADISON COUNTY, MS
211	HEINDL RD AND KING RANCH RD, MADISON COUNTY, MS
289	GREEN ACRES DR AND HWY 16W, MADISON COUNTY, MS
260	GREEN ACRES AND KING RANCH, MADISON COUNTY, MS
72	RAILROAD ST AND MARTIN LUTHER KI, MADISON COUNTY, MS
11	GREEN ACRES AND RAILROAD ST, MADISON COUNTY, MS
157	E HWY 16 AND ROYAL OAK RD, MADISON COUNTY, MS
304	PEACE ST, MADISON COUNTY, MS
235	HWY 16 AND HWY 43, MADISON COUNTY, MS
8	W HWY 16 AND GREEN ACRES, MADISON COUNTY, MS
115	FINNEY RD AND MORGAN RD, MADISON COUNTY, MS
271	CMUANDRAILROAD, MADISON COUNTY, MS
19	HWY 16 AND AVONDALE RD, MADISON COUNTY, MS
166	S LIBERTY ST AND W DINKINS ST, MADISON COUNTY, MS
295	E HWY 16 AND COUNTRY CLUB DR, MADISON COUNTY, MS
158	ACADEMY ST AND LYON ST, MADISON COUNTY, MS
321	HWY 16 AND GREENFIELD DR, MADISON COUNTY, MS
107	SULPHUR SPRING RD AND GIN RD, MADISON COUNTY, MS
240	E HWY 16 AND ROBINSON RD, MADISON COUNTY, MS
124	HWY 43 AND TURCOTTE LAB DR, MADISON COUNTY, MS
344	YANDELL RD AND BAINBRIDGE CROSSI, MADISON COUNTY, MS
85	HWY 17 AND SULPHUR SPRINGS RD, MADISON COUNTY, MS

Source: Funderburk Report, Appendix D; Mississippi Transverse Mercator NAD83 Projection; Madison County Census Tract Polygon Data

EXHIBIT 4

**UNITED STATES DISTRICT COURT
FOR THE SOUTHERN DISTRICT OF MISSISSIPPI
NORTHERN DIVISION**

LATOYA BROWN; LAWRENCE BLACKMON;
HERBERT ANTHONY GREEN; KHADAFY
MANNING; QUINNETTA MANNING; MARVIN
MCFIELD; NICHOLAS SINGLETON; STEVEN
SMITH; BESSIE THOMAS; and BETTY JEAN
WILLIAMS TUCKER, individually and on behalf of a
class of all others similarly situated,

Plaintiffs,

v.

MADISON COUNTY, MISSISSIPPI; SHERIFF
RANDALL S. TUCKER, in his official capacity; and
MADISON COUNTY SHERIFF'S DEPUTIES JOHN
DOES #1 through #6, in their individual capacities,

Defendants.

Civil Action No.
3:17-cv-00347-WHB-LRA

REBUTTAL EXPERT REPORT OF ROBERT MCNEILLY

July 2, 2018

TABLE OF CONTENTS

I. QUALIFICATIONS	3
II. MATERIAL REVIEWED	4
III. ASSIGNMENT AND SUMMARY OF FINDINGS	6
A. Assignment	6
B. Summary of Findings	6
IV. METHODOLOGY	7
V. EXPERT OPINIONS	7
A. MCSD's Documentation of Policies and Procedures.....	7
B. Training	8
1. Training Best Practices	8
2. Training Experience of Chief Dunston	9
C. Supervision	10
1. Supervision in General	10
2. Hiring Policies	12
3. Lack of Performance Evaluations	12
4. Lack of an Early Warning System	12
D. Non-Biased Policing	13
1. Written policies alone are insufficient	13
2. MCSD's management appears uninterested in monitoring for biased policing.....	14
3. Tracking and analyzing data is important	14
4. Monitoring for biased policing is important	16
5. Racial slurs are not "a gray area."	16
6. Community Policing	17
E. Investigation of Complaints	18
F. Roadblocks, Pedestrian Stops, and Home Entry	20
1. Roadblocks	20
2. Pedestrian Stops	22
3. Home Entry	23
G. Record-Keeping and Forms	24
1. Record-Keeping	24
2. Forms	25
H. Review of Specific Incidents.....	26

I. QUALIFICATIONS

1. I am a partner in The McNeilly Group, L.L.C. and provide consulting services to municipalities and police departments. The consulting services cover a wide-range of police operations including management, policy development, training, supervision, discipline, conducting internal affairs investigations, use of force, developing and using early intervention systems, and other police matters.
2. I was appointed a member of the federal monitoring team to monitor the consent decree between the United States of America and the City of New Orleans. The monitoring team monitors the New Orleans Police Department's compliance with the consent decree.
3. I am a member of the federal monitoring team for the consent decree between the United States of America and the City of Baltimore, Maryland.
4. I served as a member of the Pittsburgh Bureau of Police in the City of Pittsburgh for 29 years and served as the chief of police from 1996-2006. During my first years serving as chief, I led the department through a consent decree between the United States of America and the City of Pittsburgh. The Pittsburgh Bureau of Police achieved compliance with the consent decree within 2 ½ years and was released from the consent decree following 3 years of compliance.
5. I served as the chief of police in Elizabeth Township, Pennsylvania for 8 years, from 2006-14.
6. I served in the United States Marine Corps from 1970 to 1972 and I served in the United States Coast Guard Reserves from 1987 to 2011.
7. I have worked with the United States Department of Justice as a subject matter expert during and after their investigations of departments. I have reviewed policies, use of force reports, and internal affairs investigations in many locations in New York, New Jersey, Pennsylvania, and Illinois.
8. I have taught basic recruit classes, supervisor in-service, and firearms courses to various departments in Pennsylvania.
9. I have taught recruit training and law enforcement courses for Indiana University of Pennsylvania, Penn State University, and the University of Pittsburgh.
10. I have provided instruction in many states for High Impact Supervision, POLEX (police executive course) and Advanced POLEX (third and fourth weeks of POLEX.) The POLEX courses included two days of managing liability. At the end of those courses I provided attendees with example policy manuals for citizen compliant investigations.

11. I worked with Penn State University's (Justice and Safety Institute) to conduct promotional interviews for the Trinidad/Tobago Police Services.
12. During my police career, I have worked with various groups such as the International Association of Chiefs of Police ("IACP"), The Major Cities Chiefs, and the Police Executive Research Forum on new developments or important issues in policing. Many of those working groups led to police publications from the IACP, the Community Oriented Police Services, or the Police Executive Research Forum.
13. I participated in a study with the IACP concerning the subject of protecting citizens' civil rights. I later presented at the IACP annual meeting in 2015 on the subject of (1) conducting internal affairs investigations and (2) early intervention systems.
14. I have made many presentations during my career on additional important police matters including racial profiling and traffic stops. I presented at Northwestern University's national symposiums in 2000, 2003 and 2005. I also presented at the IACP Police Traffic Stop Summit in Washington D.C. in 2000 and the "Deadly Force, Race, and Disorder" Police Executive Research Forum annual meeting in 1997.
15. I have provided the following testimony during the past four years:
 - *Wilkinsburg, PA vs. Sgt. John Snyder* (10/22/15)
 - Expert witness - Search and Seizure
 - *Lancaster Twp.; Butler County; PA. vs. Officer David Sitler* (3/27/17 - 3/28/17)
 - AAA Case No. 01-16-0005-1503
 - Expert witness - Use of force
16. My CV is attached as Appendix A to this report.

II. MATERIAL REVIEWED

17. Materials reviewed included the following:
 - Class action complaint for declaratory and injunctive relief and individual damages
 - Plaintiffs' brief in support of plaintiffs' motion for class certification
 - Defendant's brief in opposition to plaintiffs' motion for class certification
 - Mark Dunston's report and attachments
 - MCSD Policy Handbook
 - MCSD Use of Force Policy
 - MCSD Sobriety Checkpoint and Roadblock Policy
 - Tracking of deputy activities (MC-RFP (2) 26-1—MC-RFP (2) 26-6415)
 - ACLU record request for use of force reports (November 9, 2016)

- MCSD response to record request for use of force (December 6, 2016)
- ACLU record request (May 2, 2017)
- MCSD response to record request (May 8, 2017)
- ACLU record request (February 16, 2017)
- MCSD response to record request (February 17, 2017)
- Taser reports (MC—TASER RPT-1—MC—TASER RPT-279)
- Requests for assistance (MC-RFP 10-25—MC-RFP 10-42)
- Deposition Transcripts
 - Retired Sheriff Trowbridge
 - Sheriff Tucker
 - Chief Deputy Williams
 - Deputy Waldrop
 - Chief Mark Dunston
- Declarations
 - James Bacon
 - Michael Bracy
 - Anthony Brown
 - Bysheba Brown
 - Willie Carter
 - Rasheid Davis
 - Veronica Davis
 - Demario Day
 - Domunique Doss
 - Undrea Guise
 - Kenneth Harris
 - Lester Hollins
 - Destiny Jones
 - Lisa Lewis Jones
 - Archie McKay
 - Antonio Mitchell
 - Earnest Pate, Jr.
 - Terrance Thompson
 - Montreal Tillman
 - Delores Smith
 - Quincy Smith
 - John Spann
 - Antonio Howard
 - Lawrence Blackmon
 - Latoya Brown
 - Khadafy Manning
 - Michelle Williams
 - Earline Wilder

- Incident reports
 - MCSO CAD 2015-4075
 - MCSO CAD 2016-2097, 2016-2098
 - MCSO CAD 2016-18449, 18450
 - MCSO CAD 2016-17715
 - MCSO CAD 16-19279
 - MCSO CAD 15-8117
 - MCSO CAD 15-19058
 - MCSO CAD 16-4699

III. ASSIGNMENT AND SUMMARY OF FINDINGS

A. Assignment

18. I have been asked by Simpson Thacher & Bartlett LLP, the American Civil Liberties Union of Mississippi Foundation, and the American Civil Liberties Union Foundation, Counsel for Plaintiffs in this action, to provide my expert opinion in a rebuttal report to Chief Mark Dunston's Expert Report regarding the policies and practices of the Madison County Sheriff's Department ("MCSD" or "MCSO").

19. I am being compensated for my services at a rate of \$150 per hour. Given the *pro bono* nature of this matter, I have not billed for all of my time.

B. Summary of Findings

20. After reviewing the materials and Chief Dunston's Report, I disagree with Chief Dunston's opinions regarding the Madison County Sheriff's Department's policies, procedures, and practices. Chief Dunston stated that MCSD's policies were sufficient as long as the policies themselves do not specifically violate explicit legal requirements, and are consistent with Chief Dunston's view of "generally accepted policing practices," a standard that Chief Dunston does not explain in his report and that seems to reflect his overall sense of policing practices in Mississippi law enforcement agencies. *See* Dunston Tr. 39:14-40:4. I disagree. There are best practices and there are substandard practices. All law enforcement agencies should comply with best practices. I conclude that the MCSD does not employ best practices for written policies, training, supervision (including the lack of an early intervention system), non-biased policing (including inadequate community policing), complaints/internal affairs investigations, roadblocks, pedestrian stops, home entry, record-keeping and forms. In my expert opinion, the policies, practices, and procedures of the Madison County Sheriff's Department, as well as the attitudes expressed by senior management of the department, are indicative of an environment that turns a blind eye to and fosters biased policing.

IV. METHODOLOGY

21. I reviewed various documents including depositions, reports, and affidavits to determine the structure, management, operations, policies, procedures, and practices of the Madison County Sheriff's Department. I compared their operations with what are best practices. Best practices are accepted, from research and experience, as producing the best results. While a law enforcement agency that does not follow best practices may or may not engage in biased policing or other civil rights violations, failure to follow best practices makes it substantially more likely that such violations will occur, and that violations that do occur will not be detected or corrected, at least without external pressure such as a lawsuit. Comparing a law enforcement agency's policies, practices, and procedures with law enforcement best practices is a common and consistently applied method when evaluating law enforcement agencies. Best practices in law enforcement have developed from various research, studies, training, symposiums, and the experiences of experts in policing. Some of those sources include: (1) International Association of Chiefs of Police ("IACP"), (2) Department of Justice's Office of Community Oriented Police Services (the "COPS Office"), (3) the Police Executive Research Forum, (4) The Commission on Accreditation for Law Enforcement Agencies, and (5) the United States Department of Justice (best practices outlined in consent decrees). In reaching my conclusions I also drew upon my four decades of law enforcement experience as a police officer, police chief, law enforcement consultant, and federal consent decree monitor. Based on my experience, training, knowledge, and qualifications I am an expert in law enforcement, including best practices.

V. EXPERT OPINIONS

A. MCSD's Documentation of Policies and Procedures

22. Chief Mark Dunston states that he "reviewed the MCSO policy manual and found the policies to be consistent with those found throughout the law enforcement profession, particularly those agencies within the State of Mississippi." (Dunston Report at 5.) Chief Dunston also states that he considers MCSO's policies to be "operationally sound." (*Id.*) I disagree.

23. The Madison County Sheriff's Department policies I reviewed do not contain some basic information that should be included in every department policy and lack the organization a policy manual should have. In addition, policy changes are not always properly documented.

24. Some of the information lacking in each MCSD policy is (1) issue date, (2) effective date, (3) annual review date, (4) any policy rescinded by the current policy, (5) the number of pages at the beginning of the policy (to ensure all pages are included) or an indication of the last page of the policy, and (6) the signature of the Sheriff.

25. For example, Retired Sheriff Toby Trowbridge, during his deposition, stated he didn't know if a roadblock policy was his since it wasn't dated or signed by the Sheriff. Trowbridge Tr.

23:6-24:4; 65:23-66:22. That's the main reason policies should be dated and signed. They provide a record of department policies and ensure the deputies working under those policies know they are legitimate.

26. During his deposition, Chief Deputy Jeremy Williams said written policies can be changed with oral direction from the sheriff. Williams Tr. 17:25-18:11. If there are any changes to a written policy, they should be made in writing. If a change occurs in a policy before the next annual review, the sheriff or the chief should write a memo with the change, have each member of the department sign acknowledgement, and place the memo with the policy (general order) until the policy is updated. There should not be any time when a written policy is not in effect. The memo should also serve as a history for the change in any policy.

B. Training

1. Training Best Practices

27. Chief Dunston writes in his report, "The plaintiffs claim that the MCSO is deliberately indifferent towards its citizens exhibited by a lack of training, supervision and complaint investigation. As to MCSO's training, the sworn officers of the MCSO are certified by the Mississippi Board on Law Enforcement Officers Standards and Training (BLEOST). Statutorily, the only training required for sheriff's deputies in the State of Mississippi is basic certification training. Any in-service or advanced training for a deputy past that initial certification is above the statutory requirements." (Dunston Report at 13.)

28. Just because training isn't mandated by a state doesn't mean training shouldn't be conducted for officers and deputies. Regular training in important topics is imperative since officers can forget initial training, procedures regularly change due to changes in the law and court decisions, and officers/deputies should be reminded of the proper procedures in the event they have developed inappropriate methods of policing due to common beliefs of what is permissible or acceptable. Best practices expect a department to conduct more than just mandatory training. A department should be conducting regular training and training in areas of high risk/low frequency.

29. Law enforcement agencies should have a structured field training program that would include:

- Trained field training officers
- A field training supervisor
- A field training manual
- Daily and weekly performance evaluations
- Evaluations performed by multiple training officers

30. The training officer should know all the policies and provide regular training for new policies, low incident/high risk policies, and review the data from use of force reports and search and seizure reports to determine the level of compliance with policies in order to develop annual training. Officers should be tested on their knowledge as well.

31. A department conducting training and documenting training should maintain a record of training provided and who attended and when they attended. The department should also contain a file for each deputy explaining what training was provided, who provided the training, the subject matter, the date of the training, and the hours of training provided. I have taught this to many departments in many different training courses.

32. During Deputy Waldrop's deposition, he said MCSD provided no training regarding the complaint process, Waldrop Tr. 32:16-33:3, reporting misconduct, *id.* at 33:24-34:4, roadblocks, *id.* at 35:22-24, asking passengers for identification, *id.* at 44:4-6, searches of vehicles at roadblocks, *id.* at 47:23-25, or searching homes, *id.* at 58:11-15. He also said he was unsure if the department had a policy on racial profiling. *Id.* at 59:16-21. Law enforcement agencies should provide training on these topics.

33. During his deposition, Sheriff Tucker stated his deputies aren't tested on new policies. R. Tucker Tr. 111:14-18. He also stated there is no training for new policies. *Id.* at 112:16-25. Sheriff Tucker stated he doesn't believe there is a curriculum to address decisions based on race. *Id.* Law enforcement agencies should conduct training and/or testing on new policies.

34. During his deposition, Chief Deputy Williams said he discussed treating all people fairly once a year at general meetings. Williams Tr. 40:24-41:4, 41:17-21. If the general meetings are used as a training session, the sessions should have a lesson plan and the training should be documented in every deputy's training file.

35. During his deposition, Deputy Chief Williams said it wouldn't be the department policy to ask passengers their name or demand identification. Williams Tr. 220:14-16. However, this was done in one of the specific incidents reviewed by Chief Dunston and myself. (Dunston Report at 19.) Policy, training, and supervision should reinforce how traffic stops are conducted. In addition, this incident indicated there is a gap between policy (as described by the chief deputy) and the performance of deputies on the road. If supervisors reviewed police reports, arrest reports, and use of force reports and noted the performance of deputies who didn't conform to policy and training, they should be required to take supervisory action. That action could be: (1) change in policy, (2) change in training, (3) counseling of a deputy, or (4) discipline (reprimands to suspensions and/or termination for repeated infractions).

36. In addition, a department should be capturing data in all of its interactions with the public especially in uses of force, complaints, arrests, traffic stops, pedestrian stops, searches/ seizures, and other important areas of performance. The data should be used to conduct a needs assessment to develop additional training for the department.

2. Training Experience of Chief Dunston

37. Chief Dunston has listed courses for which he provided instruction that included "Street Survival" courses. (Dunston Report at 33.) There is considerable concern among police executives as to what this training does to impact how officers handle traffic stops and how they treat the citizens they encounter. The training appears to be geared toward instructing officers to utilize force quickly to avoid their victimization. Many law enforcement executives believe

training by Calibre Press leads to officers becoming concerned that every encounter necessitated abruptness and distrust, and is inconsistent with the concept of community policing. Many law enforcement executives have refused training days or funds for officers to attend Street Survival training. There is a belief in some law enforcement agencies and among some community members that this type of training is leading to unnecessary deaths. Another course from Calibre Press, the Bulletproof Warrior seminar, has been the subject of similar concerns.

38. A recent article by Jennifer Bjorhus of the *Star Tribune* stated:

“The Houston Police Department, for example, won’t pay for its officers to attend the Bulletproof Warrior seminar, which is put on by an Illinois for-profit company called Calibre Press. And the leader of an international police training association said he thinks some seminars like those offered by Calibre and other firms foster a sense of paranoia among officers. ‘Police training became very militaristic and it caused a lot of the problems that are going on in the nation,’ said Michael Becar, executive director of the International Association of Directors of Law Enforcement Standards and Training, with offices in Idaho and Washington, D.C. Becar, who leads the international law enforcement training group, said his organization has no position on LifeLine Training and Calibre. But he said he has attended Calibre classes. ‘Everything they were doing made the police officers very paranoid,’ Becar said. ‘At some point they wouldn’t even stop a car without three backups.’” Jennifer Bjorhus, *Officer who shot Castile attended ‘Bulletproof Warrior’ training*, STAR TRIBUNE (July 14, 2016).

C. Supervision

39. Chief Dunston’s report states, “MCSO’s supervisory practices are similar to those found throughout law enforcement agencies within the State of Mississippi. MCSO supervisors review and approve or remand reports filed by deputies, supervisors respond to scenes in support of deputies and in response to requests for supervisors after uses of force.” (Dunston Report at 13.) However, I have found several inadequacies in MCSO’s supervisory practices.

1. Supervision in General

40. I understand that Retired Sheriff Trowbridge set the supervision standard for the department,¹ and Sheriff Tucker continued the policies and practices of Sheriff Trowbridge. R.

¹ During retired Sheriff Trowbridge’s deposition, he stated “I learned a long time ago that the best thing a sheriff can do is just be there and assist his men, assist the public, or observe, and that I didn’t say you’re going to go here or you’re going to go there or anything.” Trowbridge Tr. 37:7-11. The retired sheriff exhibited a laissez-faire style leadership. That type of leadership should never exist with a new leader. That isn’t appropriate in departments that need better policies, more training, trained and effective supervision, or adequate reporting systems. That prevented a culture of excellence from developing. The culture he established would be continued by following administrations unless and until another executive worked to ensure his/her agency employed best practices.

Tucker Tr. 92:23-93:4. Chief Deputy Williams assists Sheriff Tucker with the management of the department. As discussed below, the practices in the department under Sheriff Tucker exhibit (i) limited supervision, (ii) little effort to monitor traffic stops, (iii) an insufficient disciplinary system, and (iv) insufficient systems to capture and review use of force data.

a. Limited supervision

41. During his deposition, Chief Deputy Williams stated the supervisor reviews reports to correct typos. Williams Tr. 111:3-5. He said no supervisor ever brought an issue of concern to him from the reports. *Id.* at 110:22-111:2. This is inadequate supervision. All supervisors' signatures on any report indicate their approval of all the police actions taken during the incident. I have provided training to many departments regarding the responsibilities of supervisors. Their responsibility is far more than correcting typographical errors.

b. Little effort to monitor traffic stops

42. During his deposition, Sheriff Tucker stated he monitors the police radio to ensure deputies don't make stops based on race. R. Tucker Tr. 128:8-16. He said he has professional deputies and monitoring the radio is infrequent in the course of a sheriff's duties. *Id.* Even if a sheriff were able to listen occasionally to the race of a motorist called into dispatch (if race were called in) the sheriff would get a small window of what was occurring during traffic stops. To properly supervise, the deputy should be creating written documentation of traffic stops, regardless of whether there is a citation or arrest.

c. An insufficient disciplinary system

43. During his deposition, Chief Deputy Williams was not sure whether verbal warnings were contained in a deputy's file. Williams Tr. 49:12-19. I have provided many training courses for supervisors and police managers explaining that the essentials of policing include (1) proper hiring, (2) proper policies, (3) adequate training, (4) supervision, (5) discipline when necessary, (6) conducting adequate internal investigations, and (7) using an early intervention system. Not documenting and maintaining written records of disciplinary actions (including verbal warning or oral reprimands) does not meet the basics of supervision.

d. Insufficient systems to capture and review use of force data

44. I understand that MCSO was unable to provide data regarding the number of use of force reports, the number returned for additional information, the number approved, or any information regarding actions taken for poor reports or excessive force. Letter from Randall Tucker to Paloma Wu (Dec. 6, 2016) ("We have no method to search, find, or locate every incident report involving a use of force... There is no method to find every incident report for an entire month.") This is information that any law enforcement department should collect and be able to provide if requested.

45. Chief Dunston stated in his expert report each MCSO use of force report is reviewed by supervisors. (Dunston Report at 13.) A review by a supervisor should include the supervisor's signature that s/he reviewed the use of force. It should also include a recommendation regarding

the use of force. The recommendation should include whether the supervisor believed the use of force was (1) appropriate, (2) should be forwarded for a review by a department attorney, or (3) should be forwarded for an internal investigation. In addition, the use of force incidents should be filed and available for review during the officer's annual performance evaluation and for any necessary intervention if an officer demonstrates a pattern during use of force incidents. Based on my review of the materials, my understanding is that MCS D does not follow these best practices.

2. Hiring Policies

46. During Sheriff Tucker's deposition, he explained how they hired two deputies, Slade Moore and Officer Thompson. From the information relayed during the deposition, it was obvious that a much more thorough review of their backgrounds should have been conducted prior to their hiring. R. Tucker Tr. 203:6-204:19; 212:5-213:9. A phone call to one person in an officer's prior or current agency isn't sufficient to conduct a complete investigation. Training courses I have attended and have provided throughout the country have stressed extensive background checks are the first step towards an accountable law enforcement agency.

3. Lack of Performance Evaluations

47. MCS D does not conduct performance evaluations.² I have provided instructions to departments regarding managing liability, and completing performance evaluations has been part of the training. I taught completion of performance evaluations for in-service supervisor courses in Pennsylvania. Consent decrees, which contain best practices, contain a requirement for completion of performance evaluations. As a federal monitor, I have reviewed completed performance evaluations to ensure they complied with the consent decree. Law enforcement agencies should complete performance evaluations of officers/deputies.

4. Lack of an Early Warning System

48. Another serious agency flaw at MCS D is the absence of an early warning system (also known as an early intervention system), which is a method to track each deputy's activities including the number of arrests, citations, traffic stops, and roadblocks. Early warning systems demonstrate departments are using available data to manage personnel, identify policy and training needs, and to be responsive to community expectations.

49. Early warning systems have been the subject of studies (Vera Institute), books (*Good Cops*), COPS Office publications, IACP publications, IACP training sessions, and consent

² During Deputy Waldrop's deposition, he stated he received structured feedback whenever he was interviewed for a promotion, but also stated there was no annual evaluation. Waldrop Tr. 26:25-27:25. During Sheriff Tucker's deposition he said the department didn't conduct performance evaluations. R. Tucker Tr. 214:25-215:12.

decrees.³ Law Enforcement agencies throughout the country are developing early warning systems. The IACP has a model policy regarding Early Intervention Systems.

50. During Chief Dunston's deposition, he wasn't familiar with early warning systems. Chief Dunston described early warning systems as "stuff for internal affairs following lifestyle practices, bank accounts, purchases, debt. Things like that." Dunston Tr. 96:4-16. Early warning systems include much more than internal affairs cases, and they don't include lifestyle practices, bank accounts, purchases, debts or related personal information.

51. During Chief Dunston's deposition, he said an early warning system is, "a marketing program from the computer software people that are marketing it to you." That's not correct. An early warning system can be nothing more than a series of spreadsheets. For example, all officers listed on one spreadsheet titled use of force, another titled citizen complaints, another one titled traffic stops, etc. Once they are entered, the data can be sorted from the highest to lowest to see which officers are leading the department (for example the top 10-20% of officers in each category). The more areas they are leading their peers can indicate which officers' performance should be reviewed.

52. During Chief Dunston's deposition, when asked the question, "[F]or example, what if you saw one officer had 90 percent of the arrests for disorderly conduct? Would that be something that you would review or would that be something that would raise a red flag for you?" Chief Dunston answered, "No." Dunston Tr. 121:21-122:2. If in any area, such as traffic stops, pedestrian stops, uses of force, citizen complaints, vehicle collisions, missed court cases, sick leave, weapon discharges, an officer exceeds his/her peer group there should be a review by supervisors.

D. Non-Biased Policing

1. Written policies alone are insufficient

53. Chief Dunston stated in his expert report the following: "As noted above, I reviewed MCSO Policies and Procedures Manual. Section 34(c) provides that 'Law enforcement officers will remember that he/she are sworn to protect and serve all citizens of this community equally. Race, color, religion, age, sex, political belief or other personal opinions shall not interfere with the equal administration of justice to all citizens within this jurisdiction.'" (Dunston Report at 13.)

54. It is good to have this statement in a policy manual. However, law enforcement executives realize not all police officers/deputies abide by all department policies and rules. Just

³ Chief Dunston acknowledged during his deposition that he hasn't reviewed consent decrees to learn about law enforcement policies and procedures. Consent decrees resulting from "pattern or practice" investigations have been in existence since 1996. All consent decrees are available for viewing. The consent decrees contain the "best practices" for policing including traffic stops, internal affairs investigations, and early warning systems (also known as early intervention systems).

because this line is included in the policy manual doesn't ensure officers/deputies adhere to the policy. To ensure compliance, departments should provide policy, training, supervision, and discipline when necessary. Best practices also require departments to document and track statistics (like traffic stops) to ensure officers are abiding by the policy statement. There is also a need to track each officer's/deputy's statistics to provide evidence they adhere to the requirement to treat people equally.

55. During Chief Dunston's deposition, in response to the question, "Is having a written policy alone sufficient to ensure bias-free policing?" Chief Dunston said, "For an agency, yes." Dunston Tr. 191:4-6. It is a stretch to believe all officers/deputies adhere to all policies. Chief Dunston even acknowledged in his deposition there are some who have "evil in their hearts." Dunston Tr. 191:8-10. If a policy alone would suffice to ensure officers performed properly there would be no need for training, supervision, discipline, officer terminations from employment, or officers being arrested. Supervisors and management are responsible for reviewing all the activities of their personnel, not just the number of miles they drive, the number of reports they complete, or the number of arrests they make, which is the practice of MCSD.

2. MCSD's management appears uninterested in monitoring for biased policing

56. In general, MCSD's management appears to be uninterested in identifying and preventing racial discrimination. For example, Sheriff Tucker stated that "I don't monitor anybody to see if they're performing in a racially discriminatory manner." Tucker Tr. 218:14-19. Chief Deputy Williams also indicated that he did not actively monitor deputies for potential racial discrimination, Williams Tr. 151:10-24, and Lt. Waldrop was unaware of any MCSD training regarding non-biased policing, Waldrop Tr. 59:16-24. These attitudes of indifference toward monitoring and enforcing non-biased policing, combined with the lack of meaningful policies, practices, and procedures, can create an environment that is conducive to racial discrimination.

3. Tracking and analyzing data is important

57. All traffic stops, and the race and sex of the driver should be documented to ensure law enforcement officers aren't consciously or unconsciously profiling drivers by race or sex. The statistics from those stops should be reviewed regularly by supervisors accessing an early intervention system containing that data. Documenting and tracking traffic stops should be an effort to work with the community it serves as part of a community policing effort. I have trained thousands of law enforcement personnel on the necessity to track traffic stops including three national symposiums on the subject of racial profiling and traffic stops and in other courses including those regarding managing liability. The amount of time it takes to track traffic stops is brief and the benefit of obtaining the considerable data is important to police supervisors when monitoring subordinates' performance so that information can be provided to elected officials, and the community the agency serves. MCSD does not do keep written reports of traffic stops, other than dispatch records of the location of the stop, and does not record race information for traffic stops, R. Tucker Tr. 124:24-124:6, and Chief Dunston approved of this failure. Dunston Tr. 174:25-175:4 (Q: "Is it generally accepted practice in law enforcement to track all police encounters with citizens that involved at least a detention?" A: "No.").

58. During Chief Dunston's deposition, Chief Dunston appeared to agree that it was appropriate for the MCSD to keep no records of traffic stops other than CAD data.⁴ That is incorrect. Many law enforcement agencies (for example in Missouri, Texas, and Michigan) track traffic stops regardless of whether a citation is issued. Supervisors and police managers review this documentation to determine if the stop was legal.

59. Departments throughout the country document traffic stops and track the race and sex of drivers who are stopped to safeguard against racial profiling. Indeed, tracking stops by race and sex is mandatory in many locations. A committee in the State House in Alabama just recently endorsed a bill requiring all departments in Alabama to track race during traffic stops and require the information be turned over to the Attorney General's Office. Mallory Moench, *Bill Requiring Police to Record Race Data Clears Committee*, U.S. NEWS (Mar. 14, 2018). The fact that it may not be legally required by Mississippi state law yet doesn't mean it shouldn't be done or isn't best practice. To the contrary, a department, such as the MCSD, that fails to keep such records will be more likely to engage in racial profiling or other civil rights violations, and will be less able to identify or correct such violations when they do occur. Indeed, in my experience, it is often the case that state legislation setting standards for law enforcement agencies is often not passed until well after the need for the particular standard has become apparent.

60. Chief Dunston also stated it wasn't generally accepted practice in law enforcement to track all law enforcement encounters with citizens that involve at least a detention. Dunston Tr. 174:25-175:4. That is incorrect. Chief Dunston acknowledged tracking data can provide evidence of disparities. Many departments track pedestrian stops. For example police departments in Boston, Newark, Philadelphia, Portland, Minneapolis, and the state of Illinois track pedestrian stops regardless of whether a citation issued. Pedestrian stops have been the subject of studies to determine best practices, such as *Key Issues in the Police Use of Pedestrian Stops and Searches*, published by the Urban Institute and *Stop and Frisk: Balancing Crime Control with Community Relations*, by the Department of Justice's COPS Office. The documentation of pedestrian stops can be used for investigative purposes (who was encountered on a certain day, time, and location when crimes may have occurred) and to monitor officer/deputy performance. Tracking traffic and pedestrian stops provides data to accomplish both.

61. The data regarding the sex and race of people affected by traffic stops, pedestrian stops, arrests, searches/seizures, and use of force are all important to ensure a department adheres to non-biased based policing. Without tracking that basic data, a department can't provide evidence that bias isn't involved in any of the activities. Having the data, reviewing the data periodically, making comparisons with an officer's/deputy's peer group, and using the information for adjusting policy and training is important to ensure bias free policing. Departments track what they consider to be important. If departments don't track the race and sex of those who are stopped, searched, arrested, and subject to a use of force, it indicates the department doesn't consider it important.

⁴ Dunston Tr. 268:22-269:2. (Q: "Do you agree that there's a universe of stops that MCSD makes that results in, at most, a CAD entry; correct?" A: "Yeah. That would be true of any law enforcement agency.").

4. Monitoring for biased policing is important

62. During Chief Dunston's deposition, he said, "I just don't understand how you're going to enforce bias-based -- or nonbiased-based policing. We're using the term interchangeably, but we know what it means, I don't know how data tracking just on numbers can help you with that." Dunston Tr. 180:16-21. Chief Dunston's comments are as short-sighted as comments made by Sheriff Trowbridge, Sheriff Tucker, and Deputy Chief Williams. It is possible to enforce non-biased policing. If supervisors are provided the proper early intervention system, provided training on how to use it, and held accountable for ensuring they use it regularly, the supervisors will have the ability to make some decisions regarding a subordinate's biased or non-biased based policing. At the very least, the supervisor has data to review regarding the subordinate's performance measures to meet and discuss with the subordinate as to his/her performance. I include this training in all supervision training including managing liability.

63. During Chief Dunston's deposition, on the subject of combatting discrimination, Chief Dunston stated, "Well, you can make it the responsibility of your supervisors to monitor activity." Dunston Tr. 191:17-18. Unfortunately, MCSO hasn't provided its supervisors with the ability to do so without the proper reports (use of force, search and seizure), the needed information (citizen complaints, lawsuits, vehicle collisions, roadblocks, traffic stops, pedestrian stops, etc.), procedures (performance evaluations, early intervention systems, etc.) or the training to evaluate the officer's performance looking for patterns of behavior.

64. During his deposition, Chief Dunston said "unless I'm standing next to you 24/7, I can't guarantee that you aren't going to do something with bias towards somebody." Dunston Tr. 191:24-192:2. While it is true that most of the time a supervisor isn't on-scene to monitor an officer/deputy, this demonstrates the importance of collecting data and tracking officer activity. Those measures would provide the supervisors with the ability to effectively monitor their subordinates.

5. Racial slurs are not "a gray area"

65. During Chief Dunston's deposition, in response to a racist e-mail forwarded by Sheriff Tucker, Chief Dunston stated, "it's kind of a gray area on this unless I'm looking right at it, at the policy." Dunston Tr. 196:13-21. There is no question this e-mail is racist with the names contained in it, but Chief Dunston doesn't acknowledge that it is. Sending this type of email would violate an adequate anti-discrimination policy. Every department should have a detailed policy regarding discrimination, training provided with the policy, strong supervision to enforce the policy, and discipline for those who violate the policy.⁵

⁵ When Retired Sheriff Trowbridge was deposed, he gave similar testimony about racial slurs. He stated when his deputies used racial slurs it wasn't a violation of policy if it wasn't directed at someone. He further acknowledged the chief had used racial terms as well as many other ranking personnel in his department, including himself, and he didn't see any problem with doing so if they weren't directed at someone. Trowbridge Tr. 90:15-91:15, 96:12-97:19. This behavior

6. Community Policing

66. Community policing is an effort to reduce crime and improve interactions with the public the officers are serving through problem-solving and other methods to ensure proper policing methods are working. Community policing is an important part of non-biased policing.

67. Sheriff Tucker has not adequately engaged all communities in Madison County and has failed to provide transparency at the MCSD. During Sheriff Tucker's deposition he stated his race relation efforts were

- Community advisory group (R. Tucker Tr. 8:16-9:4)
- DARE (R. Tucker Tr. 9:5-14)
- Explorer Program⁶ (R. Tucker Tr. 9:15-23)
- Annual general meetings with the staff and encourage people to say hi. (R. Tucker Tr. 9:24-10:3)

These efforts are insufficient.

68. Sheriff Tucker stated in his deposition, when he took over the department he realized the department needed more transparency. R. Tucker Tr. 29:16-22. Without capturing the proper data, including the sex and race of motorists and pedestrians stopped, taking the appropriate action for reviewing the data, and providing information to the public regarding the data, the sheriff has not been successful in providing transparency. What further exacerbates the strain with the community is that during his deposition, the sheriff stated he doesn't read newspapers. Any law enforcement executive should be reading local newspapers, especially the front page, the front page of the local section, editorials, and the letters to the editor. Without learning what the community's needs are, the department isn't prepared to address the community's problems.

69. Sheriff Tucker doesn't seem to have adequate methods to gain feedback from the communities he serves. It is expected the CEO of any law enforcement agency attend some community meetings and to have personnel attend many more meetings and report back to the sheriff so he can personally attend the ones having serious problems and/or complaints. During Sheriff Tucker's deposition he said MCSD had no policy on traffic stops or pedestrian stops. R. Tucker Tr. 193:8-25. The trend in current policing is to have policies in place to address stops and forms to document the stops that are made. A department that has had criticism since 2006

sends a message to deputies and supervisors in the department that racism was tolerated in the department.

⁶ The DARE program and Explorer groups are an effort to attempt community policing, but they don't begin to reach out to the community adequately, especially in communities that are dissatisfied, have complained about roadblocks, have been involved in protest marches, and who have sued the department.

about traffic stops and pedestrian stops should be addressing the community's concern. This is not only a policy issue but a community policing issue.⁷

70. Many people don't understand what true community policing is since it means different things to different people. Some police believe it just means hand-shaking. Chief Dunston's explanation was vague, Dunston Tr. 81:11-24, and didn't include the basics such as (1) assigning the same officers to the same neighborhood, (2) the officers getting to know the community and its problems, (3) the police working with the community to develop methods to address reducing crime/calls for service/ public satisfaction with the police,(4) using problem solving techniques such as SARA,⁸ (5) enlisting other agencies for assistance, (6) and evaluating the officers assigned as to how effective they were.

71. Part of community policing is the interaction members of law enforcement have with the community. Chief Dunston didn't understand the concept of procedural justice. Dunston Tr. 90:24-91:20. Procedural justice amounts to four basic actions: (1) Treat people with respect; (2) Listen to what they have to say; (3) Make fair decisions; and (4) Explain your actions.

72. During Chief Dunston's deposition, Chief Dunston said intelligence led policing has replaced community policing. Dunston Tr. 82:11-16. In fact, it hasn't. Recent articles from the NYPD explain community policing is responsible for their decreases in crime. *NYPD Deploys Additional Police Officers to Further Reduce Crime & Violence in NYC*, NYPD NEWS (June 14, 2018); *Neighborhood policing programs builds relationships to cut crime*, CBS NEWS (Mar. 27, 2018). Intelligence led policing works in conjunction with community policing. Chief Dunston's testimony that community policing has been replaced is incorrect and appears to be an attempt to justify MCSD's failure to engage in community policing.

E. Investigation of Complaints

73. Chief Dunston's report states, "Complaints filed with the MCSO are directed by the Sheriff to Chief Deputy Williams. The complaints outlined in the plaintiffs' claims reflect that Chief Williams was aware of the complaints and after making his review, made a decision on the individual complaint's merits. This action is similar to what is found in sheriff's offices throughout the state." (Dunston Report at 13.) Contrary to Chief Dunston's statement, one of the most serious concerns from reading the information provided is that the MCSD does not

⁷ During his deposition, retired Sheriff Trowbridge stated he refused to meet with a group of people regarding complaints against the department. Trowbridge Tr. 103:3-17. He also refused to meet with a group who had a petition of 664 signers regarding complaints of brutality and racial profiling. *Id.* at 108:9-12. This is the antithesis of community policing. This practice of ignoring a select portion of the community failed to address growing problems and provided an example to the department that the department didn't have to be accountable to all members of the community. This type of leadership sets a culture for a department that they don't have to be accountable to the public. The culture can be passed through subsequent administrations.

⁸ The SARA model is: (1) Scan, (2) Analysis, (3) Response, and (4) Assessment.

seem to have an adequate policy directing the investigation of citizen complaints.⁹ I have taught the necessity of having a policy for the investigation of citizen complaints as part of managing liability.

74. At his deposition, Chief Dunston was asked about citizen complaints. Chief Williams stated, "If an investigation is done, I'll document that." Williams Tr. 180:8-9. I have provided training at the IACP annual meeting and in scores of other training sessions that if a complaint is filed, it should be investigated. This is accepted law enforcement practice, and the training I have provided instructed all complaints should lead to an investigation. It should not be reviewed by the chief/sheriff to determine the "individual complaint's merits."¹⁰ The chief/sheriff could decide none of the complaints merited an investigation. Once the complaint is investigated and the findings are determined, the case should go to the chief/sheriff to determine the actions to be taken.

75. Every law enforcement agency should have a written policy manual for citizens' complaints. It should include all aspects from the form used to accept a citizen complaint, how it is received, who investigates, the training provided to those investigators, the categories of complaints, the timelines for the investigations, the possible findings (sustained, not sustained, exonerated, or unfounded), and the department's actions following each of those findings. In addition to the policy manual to investigate citizen complaints, department training, and some outside training, should be provided to the investigators. Although MCSD has a written complaint investigations policy, Chief Williams's testimony suggests that the written policy is not being followed.

76. A responsible law enforcement agency should also be able to provide information to the public regarding the number of complaints received, the types of complaints, the findings and the department's actions following the findings.

⁹ Indeed, Retired Sheriff Trowbridge, during his deposition stated there was no internal affairs system when he took over as sheriff and no complaint procedure or forms. Trowbridge Tr. 25:26-16. This history of the department at that time showed the department to be in need of improvement. During his deposition, Retired Sheriff Trowbridge stated he was aware of protests related to racial profiling by his department. Trowbridge Tr. 95:17-20. He said he had not seen any complaints, but he acknowledged there was no complaint form and he did not pay attention to complaints since his chief handled them all. He accepted whatever the findings were of his chief. *Id.* at 74:25-76:3. This is counter to the training I've provided at the IACP annual meeting in 2005, to POLEX training, and to various departments requesting assistance in developing a responsible system to investigate citizen complaints. There should be a complaint form, there should be a manual explaining the process of complaint investigations, and the CEO of the department should have access to the number of complaints and the nature of the complaints.

¹⁰ Unlike the MCSD, Chief Dunston stated that his own department has designated "professional standards officer" that handles citizens' complaints. Dunston Tr. 99:22-100:3.

77. During his deposition, Chief Deputy Williams said he handled the Manning incident by speaking with the officer and reading the officer's reports. Williams Tr. 182:3-6. He did not review a recording, did not speak with two witnesses and decided no discipline was necessary. Williams Tr. 182:21-184:9. Chief Deputy Williams also said during his deposition that he handled another complaint involving Daryl Dozier, Ms. Domekia Myers-Dozier, wife, and Dshantia Dozier, daughter, age 5, by speaking with the deputy and reading the report. Williams Tr. 185:15-21; 187:4-8. Speaking with the involved personnel and reading the police reports doesn't meet the standards for an adequate investigation. I have provided many training sessions from IACP workshops, to POLEX (police executive training), High Impact Supervision training and other courses. I have advised if a department had an adequate internal affairs manual with direction for the investigations of citizen complaints, and the command staff adhered to the manual, a full investigation would be completed for every complaint.

F. Roadblocks, Pedestrian Stops, and Home Entry

1. Roadblocks

78. In his report and at his deposition, Chief Dunston approved of MCSD's roadblock policies, practices and procedures. (Dunston report at 6-7, 9-11, 13-16.) I disagree. MCSD's roadblocks policy lacks appropriate safeguards.

79. If and when roadblocks are conducted, a law enforcement department should take into account legal authority, safety concerns for deputies and the public, measures that can be taken to reduce the sense of fear or surprise the roadblock might cause the public, and the sense of fairness the public would expect. During Sheriff Tucker's deposition, he stated roadblock stops are determined by deputy discretion. R. Tucker Tr. 129:22-130:2. For a practice this controversial, deputies should have a well-explained policy, training, supervisory oversight, documentation, and reviews of the data to determine whether a checkpoint was serving the purpose it was established. MCSD lacks these safeguards.

a. MCSD's "General roadblocks" policy lacks appropriate safeguards

80. Section IX of MCSD's roadblock policy relates to General Roadblocks:

This section allows officers to conduct random roadblocks for all traffic violations, escapees or wanted subject.

The requirements of this section should not be confused with the policy set out above on the methods to be used for sobriety checkpoints.

All deputies may conduct general roadblocks when necessary to check for traffic violations, escapees, or wanted subjects upon the public streets, highways, and right-of-ways within this county.

In effect, this policy provides no real direction to deputies and permits deputies to establish roadblocks at their whim, at any time, any location, and any number of times throughout the day. Using roadblocks without necessary procedural safeguards is counter to community policing efforts, inconveniences the entire public by creating a dragnet, creates tension with the

community it may be intended to serve, and creates the opportunity for discrimination either consciously or unconsciously.

81. Policy should determine when deputies should be permitted to conduct random roadblocks, if they are permitted at all. Permitting the deputies to establish roadblocks at any time and at any location could lead to discriminatory practices. Some residents in some neighborhoods could be subjected to an unusual number of stops when traffic stops aren't coordinated, approved by supervisors, and sanctioned by policy.

82. All roadblocks and traffic stops should be documented to ensure deputies are not exhibiting bias in their traffic stops, to ensure the roadblocks and traffic stops are producing desired and effective results, and to make comparisons of the number of traffic stops and roadblocks of each officer and for the units conducting the traffic stops and roadblocks. The fact the department doesn't document the race of individuals stopped in roadblocks and the results of all stops during the roadblocks and general traffic stops creates a question as to whether MCSO is engaged in discrimination. In addition, not sufficiently tracking crime statistics and failing to make comparisons regarding the effectiveness of the traffic stops and the roadblocks with their impact on the crime statistics, which is MCSO's practice, fails to provide evidence that the roadblocks are truly effective.

83. The department has opted for national written guidelines to protect the public and their deputies for sobriety checkpoints but doesn't use the same rationale and guidelines during general roadblocks, which can be just as dangerous. In addition, because there are two written roadblock policies, deputies may choose to follow the less strict General Roadblocks policy and ignore the more detailed Sobriety Checkpoint policy.

84. During his deposition, Deputy Chief Williams said narcotics officers can use unmarked cars, but he "encourage[s]" the use of a marked unit. Williams Tr. 248:24-25 ("I always encourage when possible to have a marked unit.") This illustrates the need for an adequate policy so that officers know what is expected of them. When policy does not conform with the performance of all personnel, a liability gap exists. The accountability training I have provided discusses how (1) policy, (2) training, (3) supervision, and (4) discipline for failure to adhere to policy are essential to ensure the department is operating professionally and with the least amount of risk.

85. Finally, traffic violations can be viewed while operating or sitting alongside the road. Observing a traffic violation is reason to make a traffic stop which can be followed up with an investigation if a deputy/officer notices other violations. It may be appropriate to establish a roadblock to look for an escapee, a criminal who just committed a crime or following up on a serious crime like a homicide. Creating roadblocks to use as a dragnet for traffic offenses is not appropriate. Conducting these types of roadblocks, which is MCSO's practice, generally would only identify those who weren't licensed or under suspension or violated required insurance laws.

b. Use of unmarked vehicles at roadblocks

86. Chief Dunston's opinion about the use of unmarked vehicles and plain-clothes officers at checkpoints is contradicted by attachments to his own expert report.

87. During Chief Dunston's deposition, Chief Dunston relied upon the Traffic Safety Checkpoint Policy and NHTSA documents that he attached to his expert report but disregarded their recommendations when he chose to, such as whether to use marked or unmarked vehicles.¹¹ For example Chief Dunston disagreed with the Traffic Safety Checkpoint Policy and NHTSA policies regarding whether the public should be provided with advance notice of a checkpoint, Dunston Tr. 253:5-17, and whether officers should be allowed to use discretion in stopping vehicles at checkpoints. *Id.* at 226:13-228:8.

88. Chief Dunston also states in his report, "I do not know of any policies that mandate that plain clothes officers cannot conduct checkpoints so long as they have clothing that make them readily visible to oncoming motorists." (Dunston Report at 6.) Yet the model Traffic Safety Checkpoint Policy (attached to Chief Dunston's report) contradicts this statement. The Traffic Safety Checkpoint policy states: "All contact law enforcement officers shall be uniformed so as to assure the public that the traffic safety checkpoint is a legitimate government operation."

89. Using marked cars for sobriety checkpoints is to ensure the department doesn't frighten motorists and to make them feel reassured and safe. The presence of uniformed officers and marked vehicles is very important since they confirm the legitimacy of the activity and ease the intrusion on motorists.

2. Pedestrian Stops

90. Chief Dunston states "I reviewed no material in this case that would cause me, as a law enforcement executive or trainer, to support the argument that MCSO has a policy, custom or practice as an organization of conducting pedestrian stops without reasonable suspicion, or merely conducting a consensual encounter inquiry." (Dunston Report at 8.) He then discussed court cases and published articles discussing the definitions of probable cause and reasonable suspicion. I disagree with Chief Dunston. Based on my review of the materials, MCSD does not have adequate policies and procedures regarding pedestrian stops.

¹¹ The Traffic Safety Checkpoint Policy explains marked police vehicles should be used at checkpoints:

Visible Police Authority

- The purpose of a sobriety checkpoint is not to frighten motorists, but to make them feel reassured and safe.
- The presence of uniformed officers and marked vehicles is very important — they confirm the legitimacy of the activity and ease the intrusion on motorists.

91. The important part of reasonable suspicion and probable cause is not discussed in Chief Dunston's report. The important part of establishing reasonable suspicion or probable cause is the officer's articulation for his/her beliefs in the documentation of police reports. The articulation of events will provide evidence whether a stop was consensual or due to reasonable suspicion or probable cause.

92. For example, MCSD's drug testing policy explains reasonable suspicion in more detail than Chief Dunston provided. The department's policy states the following.

All County employees are subject to reasonable suspicion drug and/or alcohol testing under this plan. Reasonable suspicion shall be determined by a member of County management. The determination of reasonable suspicion shall be made using the Observation Checklist which is Appendix A to this plan.

If the County has reasonable suspicion that an employee is using drugs and/or alcohol in violation of this plan, he or she may be required to submit to a test. An employee will not be required to submit to a test under this provision unless the reasonable suspicion that he or she has used or is using drugs and/or alcohol in violation of this plan is based on specific objective and articulable facts and reasonable inferences drawn from those facts in light of experience.

93. MCSD has provided a checklist and provides direction to deputy sheriffs as to how their rights will be protected using reasonable suspicion when ordered to take a drug test. The policy is 11 pages with an additional 10 pages of appendixes. As the deputies are provided protections, the pedestrians within the County should be provided protections. This can be accomplished by providing specific directions (including through a written policy)¹² to the deputies when conducting pedestrian stops and the articulation necessary to legally complete a pedestrian stop.

3. Home Entry

94. Chief Dunston wrote in his expert report the following: "As is claimed in the Blackmon complaint, MCSO Deputy Scott McDonald and Lt. Jeff Waldrop went to 320 Martin Luther King, Jr. Dr. to serve an arrest warrant on Herbert Anthony Green, who the issuing court specifically indicated, on the warrant, resided at that address. Upon attempting to serve the arrest warrant, the deputies encountered Mr. Blackmon at the entrance door to the residence. Mr. Blackmon resisted the deputies' entering the residence, further causing the deputies to believe Mr. Blackmon was Mr. Green. After showing Mr. Blackmon the warrant and gaining entry into the house the deputies temporarily detained Mr. Blackmon in handcuffs while the deputies determined Mr. Blackmon's identity and secured the residence looking for Mr. Green." (Dunston Report at 12.)

95. Chief Dunston acknowledges Mr. Blackmon resisted the deputies from entering the home. As Chief Dunston explained, the deputies could enter the house if they believed Mr. Green was in the residence. However, he also said the deputies thought Mr. Blackmon was Mr.

¹² I understand the MCSD does not have a written pedestrian stop policy.

Green. If that was the case, they didn't need to search the house since they believed they already had Mr. Green in custody. It would be permissible to search anywhere the subject could reach or to conduct a security sweep only to ensure no one else was present who could provide a danger to the deputies. Conducting a search of drawers is not part of a security sweep.

G. Record-Keeping and Forms

1. Record-Keeping

96. A department should be collecting information on what it considers to be important. The MCSD does capture some data including the number of miles a deputy drives every shift, the number of citations a deputy writes and the number of arrests a deputy makes. The department should also include the number of traffic stops (by race and sex), the number of uses of force, the number of citizen complaints (as well as the nature of complaints), and the number of searches/seizures (including race and sex). I have taught development and use of these reports and they are included in consent decrees.

97. As discussed above, Sheriff's Tucker's letter dated December 6, 2016, stated, "We have no method to search, find, or locate every incident report involving a use of force." Letter from Randall Tucker to Paloma Wu (Dec. 6, 2016). This is counter to good police practice. Each use of force incident should be tracked to determine how many there were in any year, the level of resistance offered by the suspect, and the level of force used by the officer/deputy.

98. A review of the use of force incidents can be used to determine any necessary policy changes and any training needs to reduce the number of use of force incidents or provide safety measures to reduce the likelihood of future injuries. The tracking of use of force incidents should also be included to track employee performance including all uses of force, vehicle collisions, searches, lawsuits, and other important officer performance measures.

99. During Chief Dunston's deposition, he said it is not deficient if a department failed to collect data to analyze it. Dunston Tr. 117:14-17. However, as discussed above, all traffic stops, and pedestrian stops (regardless of whether they result in a citation or arrest) should be documented in writing. In addition, the number of Mississippi Statute 97-35-7, Disorderly Conduct arrests, should be reviewed for each deputy. The importance of documenting each roadblock, traffic stop, pedestrian stop, and arrest (especially arrests for discretionary charges such as disorderly conduct) is to determine which deputies are over-utilizing stops that don't lead to productive policing. The use of disorderly conduct charges is, many times, due to officer/deputy frustration, or due to their own escalation. Policy, training, and supervisor intervention can, most likely, reduce the number of discretionary arrests.

2. Forms

a. Taser form

100. I reviewed the Taser “Use of Force” forms. Some provided a substantial narrative for the use of force, and others did not. The forms lacked some basic information such as the immediate supervisor’s comments, signature and date of signature. It also failed to provide any information regarding a review conducted by a Use of Force Review Board or any command staff member. Also, it did not contain any recommendations for policy change, training, counseling, or discipline if any were necessary.

b. Incident form

101. Accountable policing requires all use of force incidents be documented, the data readily available and the number of incidents reported regularly to the public. MCSD does not meet this standard.

102. Chief Dunston stated there was no signature on the use of force form for the supervisor. He said any supervisory recommendation should not be on the form but in an after-action report. In addition, in response to the question, “On a generally accepted use-of-force report, should there be an entry for supervisor recommendation on whether use of force was reasonable?,” Chief Dunston said, “No. I don’t think it’s a determination for a supervisor to determine whether something is legally reasonable or not. I think they just look at it to make sure that it fit their policy, and then they pass it on up the chain.” Dunston Tr. 168:8-16. This is incorrect for many reasons. I have provided multiple training courses for more than a decade. I have taught it is the responsibility of the first-line supervisor to review all reports, including use of force reports. All use of force reports should mandate the supervisor make a recommendation, sign the report, and ensure it is forwarded. Chief Dunston was unable to explain where MCSD’s report goes after the supervisor reviews it, if there is any further review, if any further action is taken, or how further action is carried out (investigation, counseling, discipline, etc.). Dunston Tr. 152:22-153:19. He didn’t know if any of them had ever been reviewed by a review board, by police managers, or resulted in counseling or discipline. *Id.* at 153:22-154:11. Chief Deputy Williams testified that supervisors did nothing more than a check for spelling for the deputy reports they reviewed. Williams Tr. 111:3-5.

103. During Chief Dunston’s deposition, he acknowledged that any MCSD use of force incident he read was in the incident report as opposed to a separate use of force report. Dunston Tr. 146:18-23. There was a TASER use of force report but none for other uses of force including use of a firearm or deadly force. *Id.* at 147:22-148:5. Chief Dunston said it’s common to include use of force into an incident report. *Id.* at 148:2-13. Documenting use of force in incident reports is not adequate for a department. If the department documents the use of force only in the incident report, the department is then unable to demonstrate the use of force was reviewed by supervisors, a supervisor took the appropriate action, the department followed up on the supervisor’s recommendation/action, the use of force was available in an early intervention system, and a complete record of the department’s overall use of force incidents are available. These are all required in consent decrees and taught in police executive courses.

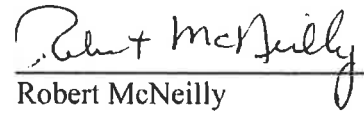
H. Review of Specific Incidents

104. In his report, Chief Dunston reviews and provides his opinion on several MCSD incident reports. Chief Dunston concluded that MCSD acted appropriately in each of these incidents. I disagree. All of these incidents raise concerns about MCSD's policies and practices. For example, MCSD deputies did not act appropriately in the following incidents:

- **MCSO CAD 2015-4075:** Chief Dunston discussed court decisions to address part of what occurred during a traffic stop but then fails to provide any court cases to justify additional actions a deputy took during the traffic stop. For example, Chief Dunston cited United States Supreme Court case of *Maryland v. Wilson*, 519 US 408 (1997), to justify having a passenger exit the vehicle they stopped. (Dunston Report at 7.) Chief Dunston only addressed a portion of the traffic stop and didn't address what legal authority required the passenger to have or provide identification, what authority required the passenger to exit the vehicle solely due to his refusal to provide identification, and what legal authority the deputy had to automatically search the passenger upon exiting the vehicle. Without some knowledge the passenger may be armed, the deputy didn't have authority to conduct a search. In addition, The deputy escalated this situation when he (1) directed his attention away from the driver who was the subject of the traffic stop, (2) demanded identification from the passenger, (3) ordered the passenger out of the vehicle, (4) attempted to conduct a pat-down, and (5) made an arrest for disorderly conduct. If the deputy focused on the driver and used better communications skills (such as "verbal judo"), followed a specific traffic stop policy that directed the deputy in his interaction with the driver, and/or used de-escalation, the stop could have been accomplished without an unnecessary arrest and further exacerbating tensions with members of the community who appear to be frustrated and angry with the way they are treated by deputies. This is not a text-book example of handling a traffic stop.
- **MCSO CAD 16-19279; MCSO CAD 15-8117.** I disagree with Chief Dunston's assessment approving the use of the TASER in these incidents. Chief Dunston's opinion is directly contrary to recent court decisions, including in the Fourth, Sixth, and Ninth Circuits, current training standards, consent decrees and current law enforcement policies throughout the country, as explained below. Basic principles regarding the use of the TASER include:
 - Deployment of the TASER is considered by the federal courts to be a "serious use of force" that is designed to inflict a "painful and frightening blow."
 - The TASER should not be deployed in cases involving minor offenses and in the absence of active physical resistance.
 - The TASER may be constitutionally deployed, even in cases involving minor offenses, when the subject presents active physical resistance that amounts to an immediate safety risk to officers attempting arrest. However, TASER deployment must immediately cease at the moment the subject no longer represents an immediate threat to the arresting officers.
 - You should not use a TASER against a subject who is simply fleeing. There must be some immediate threat of danger.

Based on these principles, the use of a TASER was not appropriate, based on the information presented in these incident reports.

- **MCSO CAD 16-4699:** Chief Dunston focused on this traffic stop search but didn't address larger, more important matters regarding traffic stops and searches. It is difficult to determine if this was a safety checkpoint or a random roadblock. Permitting deputies to conduct random roadblocks to check for traffic violations subjects many people operating legally to unnecessary delay. Stops for observed traffic violations adequately accomplishes the enforcement of traffic laws. If there was information that there were recent escapees or that a wanted person was in the area, a roadblock to locate the escapee or wanted person is expected. It appears MCSD may be using roadblocks as dragnets to identify minor violations.


Robert McNeilly

Appendix A

Robert W. McNeilly

EXPERIENCE

- Pittsburgh Bureau of Police
 - Began a career in law enforcement with the Pittsburgh Bureau of Police on February 14, 1977. I worked in the following position within the Pittsburgh Bureau of Police
 - Patrol officer for approximately 2 ½ years
 - Plainclothes officer approximately 4 ½ years (two different districts)
 - Sergeant for approximately 3 ½ years
 - in patrol,
 - in the PBP Warrant Office (approving all arrest and incident reports for all subjects arrested throughout the city)
 - two years in the Special Operations Division
 - Lieutenant (approximately 2 ½ years)
 - patrol
 - Traffic Division
 - Field Training Supervisor (9 months)
 - Commander
 - Night Watch (in charge of police operations in the city during the night shift)
 - Traffic Division
 - Zone Two (Central District in Pittsburgh) for two years
 - Chief of Police (10 years)
 - ❖ DUTIES & ACCOMPLISHMENTS
 - ✓ Led the Bureau of Police through a Consent Decree between the Department of Justice and the City of Pittsburgh.
 - ✓ Reached compliance within 2 ½ years and released from the Consent Decree within 5 ½ years. (The quickest compliance rate and earliest release from a Consent Decree since 1996.)
 - ✓ Maintained the lowest crime rates in the City of Pittsburgh in the prior 35 years.
 - The City of Pittsburgh maintained one of the lowest crime rates per capita in the nation.
 - ✓ Oversaw the downsizing of the Pittsburgh Bureau of Police from 1,275 officers in 1995 to 900 officers in 2004.
 - Low crime rates continued to be maintained with no sacrifice of core services.
 - ✓ Oversaw the computerization of the Pittsburgh Bureau of Police. Developed a computerized personnel performance system that was recognized nationally with a Webber/Seavey Award from the International Association of Chiefs of Police and Motorola.
 - ✓ Developed innovative policies, training and techniques as illustrated with another Webber/Seavey Award for an Oral Drug Extraction Technique.

Appendix A

(A technique to remove drug evidence from the mouth of a drug dealer with minimal associated dangers to officers and suspects.)

- ✓ Directed the Bureau of Police through process of certification with Institute of Ethics.
- ✓ Implemented annual training in cultural diversity, ethics, and communication skills for all sworn officers.
- ✓ Participated extensively and successfully in joint operations with federal, state, county, and local law enforcement by coordinating investigations through the "Law Enforcement Agency Directors", the "Joint Terrorism Task Force", the "Anti-Terrorism Task Force", "Operation Target", and "Project Safe Neighborhoods".
- ✓ Implemented new management procedures that significantly reduced police involved vehicle accidents (344 in 1995 compared with 132 in 2003) with associated decreases in lawsuits/claims filed against the Pittsburgh Police and a decrease in settlements/awards of similar dramatic reductions.
- ✓ Directed use of new forms (use of force, search and seizure, traffic stops, personnel performance evaluations) to capture data to manage police performance.

➤ Chief of Police in Elizabeth Twp., PA (eight years)

○ Accomplishments included:

- 1) a documented system for investigating citizen complaints
- 2) a use of force reporting system
- 3) a search/seizure reporting system
- 4) a documented field training program
- 5) a performance evaluation system
- 6) a system of testing and tracking officer knowledge regarding policies
- 7) a traffic stop reporting system
- 8) an adequate personnel file for officers
- 9) a system of tracking all chief's correspondence
- 10) first-line supervision training to supervisors and officers who would serve as officers-in-charge
- 11) police executive training to those supervisors and officers who completed first-line supervision training and desired additional supervision/management training
- 12) less-lethal instructor trained
- 13) less-lethal training and devices so officers could have additional tools to lessen the level of force necessary in some instances,
- 14) training (I personally provided and from outside sources) for officers assigned to investigate internal affairs/citizen complaints and supervisory training
- 15) field-training-officer training for the officers who would be conducting the field training

Appendix A

- Certified to instruct in Pennsylvania basic recruit classes and supervisor in-service courses
- Certified to instruct in Pennsylvania firearms training
- Provided training for Indiana University of Pennsylvania, Penn State University, and the University of Pittsburgh.
- Provided instruction in many states for High Impact Supervision, POLEX (police executive course) and Advanced POLEX (third and fourth weeks of POLEX.)
 - The POLEX courses included two days of managing liability. At the end of those courses I provided attendees with example policy manuals for citizen compliant investigations.
- Worked with Penn State University's (Justice and Safety Institute) to conduct promotional interviews for the Trinidad/Tobago Police Services
- Worked as a police subject matter expert for the U.S. Department of Justice during pattern or practice investigations or following the investigations to review policies, use of force reports, and internal affairs investigations.
- Have provided consultant expertise (through The McNeilly Group, L.L.C.) to municipalities for best practices in police management
- Have worked as a federal monitor for the consent decree between the United States Department of Justice and the City of New Orleans (New Orleans Police Department)
- Am a member of the monitoring team for the consent decree between the United States Department of Justice and the City of Baltimore (Baltimore Police Department)

EDUCATION

- Graduate work, Public Policy Management: University of Pittsburgh; Pittsburgh, Pa. (1999-2001)
- BA, Psychology (Cum Laude): **Duquesne University**; Pittsburgh, Pa. (1972-1980, part-time)

SPECIAL TRAINING

- Police Pistol and Shotgun Firearms Instructor, Monroeville, Pa. (5/09)
- US Secret Service Dignitary Protection; Washington D.C. (8/05)
- Law Enforcement Exchange Program; Terrorism training; Jerusalem and Tel Aviv, Israel (4/05)
- Advanced Tactical Management; International Association of Chiefs of Police (2001)
- National Executive Institute; Federal Bureau of Investigations Academy, Quantico, Va. (1997)
- POLEX (Police Executive, Penn State University), 7/99
- Senior Management Institute for Police; Police Executive Research Forum, Boston, MA. (1996)
- Command Institute for Police Executives; Pennsylvania Chiefs of Police, (1996)
- Emergency Management; National Fire/Emergency Management Academy, Emmitsburg, MD. (1996)

Appendix A

- Police Instructor; Municipal Police Officer Education and Training Commission (1993)
- Police Rifle Instructor School; Allegheny County Police Academy/NRA (1987)
- Law Enforcement Supervision; POSIT (Police Officer Supervisory In-service Training) Pennsylvania State University (1986)

AWARDS

- Coast Guard Commendation Award; US Coast Guard, 2011
- Leadership Award; Police Executive Research Forum, 2003
- Coast Guard Achievement Award (District 8 enlisted person of the year); US Coast Guard, 2002
- Meritorious Service Award; Mayor of the City of Pittsburgh, 2000
- Cooperation in Investigations; Drug Enforcement Administration, 2000
- Leadership Award; Western Pennsylvania Chiefs of Police, 1998
- Leadership Award; American Society of Industrial Security, 1996
- Leadership Award; Pittsburgh School Police, 1996
- Leadership Award; Fraternal Order of Police, 1996

ASSOCIATIONS

- Police Executive Research Forum, 1996 – present (Treasurer, 2003-2005)
- Major Cities Chiefs, 1996 - 2006 (East Coast Executive Board member 2001-2003)
- National Executive Institute Associate, 1997 – present (FBI Academy Graduate Association)
- International Association of Chiefs of Police, 1996 – present
- Pennsylvania Chiefs of Police, 1996 – present
- Western Pennsylvania Chiefs of Police, 1994 – present
- Allegheny County Chiefs of Police, 1996 – present (2015 president)

COMMITTEES

- Homelessness Committee member; Pittsburgh and Allegheny County (2000 – 2004)
- Advisory Board member; Allegheny County Community College (2002 – 2006)
- State and Local Advisory Board; National Office for Domestic Preparedness (1999 - 2002)
- Advisory member (Police Executive Research Forum representative); Federal Law Enforcement Training Center (2004 – 2006)

WORKING GROUP MEMBER

- DOJ – Civil Rights Division; Office of Justice Programs (8/2004)
- Terrorist Alert Policy Project; Major Cities Chiefs (4/2004)
- Critical issues in policing; Police Executive Research Forum (3/2004)
- DOJ Civil Rights Investigations; US Attorney Janet Reno (11/2000)

Appendix A

PRESENTATIONS

- Excellence In Policing; DOJ grant through Rutgers University, DOJ, and New Jersey State Police, (1/2013)
- 2011 International Conference on Innovative Solutions for Law Enforcement – Accountability (5/11)
- New Jersey Law Enforcement Accreditation Annual Meeting – Accountability (10/08)
- Minnesota Chiefs of Police - Early Intervention Systems, (4/07)
- Upper Mid-West Community Policing Institute, Minneapolis, MN – Innovations in Accountability (1/06)
- IACP workshop presenter – Internal Affairs Investigations and Early Intervention Systems, (9/05)
- Fourth National Symposium on Racial Profiling and Traffic Stops, Northwestern University (4/05)
- Third National Symposium on Racial Profiling and Traffic Stops; Northwestern University (9/03)
- National Symposium on Racial Profiling and Traffic Stops; Northwestern University (9/2000)
- Police Traffic Stops Summit; IACP – Washington, DC (9/2000)
- Deadly Force, Race, and Disorder; Police Executive Research Forum Annual Meeting (5/97)
- Various consent decree and early intervention system presentations at the Police Executive Research Forum annual meeting, the Major Cities Chiefs meetings, and the FBI National Academy.

MILITARY

- United States Coast Guard Reserves (Chief Petty Officer - Retired); 6/1/1987 to 2/12/11
- United States Marine Corps (Lance Corporal, rifleman -0311); 6/1970 – 6/1972
- USCG Active duty following 9/11/01 (9/2001 – 1/2002), commencement of Iraqi offensive, (3/2003 – 7/2003), New Orleans post-hurricane salvage operations (5/2006 – 6/2006)

HOBBIES

- Powerlifting
 - ✓ Pennsylvania Police Olympics silver medal in 1983
 - ✓ Pennsylvania Police Olympics gold medal in 1984
- Trained in several styles of martial arts
 - ✓ Shorin-ryu karate
 - ✓ Judo
 - ✓ Tae Kwon Do - 4th degree black belt

Appendix A

BUSINESS/PERSONAL

- Married to retired Police Commander Catherine McNeilly (Pittsburgh Bureau of Police) who started The McNeilly Group, LLC in February 2006.

My work has been described in the following publications:

1. The book Good Cops by Dr. David A. Harris (Chapter 5 – EWS)
2. Community Oriented Policing publication titled “Good to Great Policing: Application of Business Management Principles in the Public Sector”
3. Community Oriented Policing publication titled “Supervision and Intervention within Early Intervention Systems: A Guide for Law Enforcement Chief Executives”
4. Community Oriented Policing publication titled “Early Intervention Systems for Law Enforcement Agencies: A Planning and Management Guide”
5. Community Oriented Policing publication titled “Strategies for Intervening with Officers through Early Intervention Systems: A Guide for Front-Line Supervisors”
6. Community Oriented Policing publication titled “Federal Intervention in Local Policing: Pittsburgh’s Experience with a Consent Decree” - <http://www.cops.usdoj/ric/ResourceMain.aspx?RID=90>
7. An FBI National Executive Institute/Major Cities Chiefs publication “To Lead, To Learn, To Leave a Legacy” (June 2005)
8. The book Leadership Matters: Police Chiefs Talk About Their Careers by Chuck Wexler (Executive Director of the Police Executive Research Forum)
9. Turning Necessity into Virtue: Pittsburgh’s Experience with a Federal Consent Decree – <http://www.cops.usdoj/ric/ResourceMain.aspx?RID=217>
10. Two different publications from the Vera Institute (regarding the consent decree compliance in Pittsburgh) – www.vera.org

EXHIBIT 5

Barry Chandler
UNITED STATES DISTRICT COURT
FOR THE SOUTHERN DISTRICT OF MISSISSIPPI
NORTHERN DIVISION

LATOYA BROWN; LAWRENCE BLACKMON;
HERBERT ANTHONY GREEN; KHADAFY
MANNING; QUINETTA MANNING; MARVIN
MCFIELD; NICHOLAS SINGLETON;
STEVEN SMITH; BESSIE THOMAS; AND
BETTY JEAN WILLIAMS TUCKER,
INDIVIDUALLY AND ON BEHALF OF A CLASS
OF ALL OTHERS SIMILARLY SITUATED PLAINTIFFS

VERSUS CIVIL ACTION NO. 3:17-CV-00347-WHB-LRA

MADISON COUNTY, MISSISSIPPI;
SHERIFF RANDALL S. TUCKER, IN HIS
OFFICIAL CAPACITY; AND MADISON COUNTY
SHERIFF'S DEPUTIES JOHN DOES #1 THROUGH
#6, IN THEIR INDIVIDUAL CAPACITIES DEFENDANTS

DEPOSITION OF BARRY CHANDLER

APPEARANCES NOTED HEREIN

DATE: NOVEMBER 1, 2017

PLACE: MARRIOTT

200 EAST AMITE STREET

JACKSON, MISSISSIPPI

TIME: 2:30 p.m.

REPORTED BY: TODD J. DAVIS

BCR, CSR #1406, RPR

Job No. 133052

Page 46

Barry Chandler

A. Yes.

Q. What kinds of classes did you take?

A. TASER training, tourniquet, firearms training.

Q. And for the TASER training, did you receive a certification or something after taking that training?

A. Yes.

Q. And what about the firearms training? Did you also receive --

A. Yes.

Q. And did you renew those certifications each year?

A. Yes.

Q. And did you ever receive any training on, for example, how to conduct a traffic stop?

A. Not while at the Madison County Sheriff's Department.

Q. And when did you receive such training? Not at the Madison County Sheriff's Department, you mentioned.

Did you receive it previously when you worked at a prior police department?

A. Through the police academy.

Page 47

Barry Chandler

Q. And did you ever receive any training on searching vehicles while at the Madison County Sheriff's Department?

A. No.

Q. And did you receive training on searching vehicles when you were at the police academy?

A. Yes.

Q. And while at the Madison County Sheriff's Department, have you ever had any training on the use of race as a factor in policing?

A. Use of -- I --

Q. Use of race as a factor in policing?

A. No.

Q. And prior to your employment with the Madison County Sheriff's Department, had you ever received training on the use of race as a factor in policing?

A. No.

Q. And to your knowledge, while you were at the Madison County Sheriff's Department, were you aware if the MCSD ever had a policy against racial profiling?

Page 48

Barry Chandler

A. Yes.

Q. And do you know that policy was?

A. I do not.

Q. Do you recall if it was written in any --

A. It's written in our policy and procedures manual, yes.

Q. And did you have a copy of the policy and procedures manual?

A. I did.

Q. And while you were at the MCSD, were there ever any changes to the policies for conducting, for example, a traffic stop?

A. I'm not aware of changes to that policy.

Q. And were you aware of any policies regarding setting up, for example, a roadblock?

A. Yes.

Q. And do you recall if that policy was in writing?

A. Yes.

MS. SIVASHANKER: I'm going to introduce here as Exhibit -- I believe we're on 2, which is labeled Policy and Procedure, Sobriety Checkpoint Guidelines. And it's

Page 49

Barry Chandler

Bates stamped as MC-RFP-2-1.
(Exhibit No. 2 marked for identification.)

BY MS. SIVASHANKER:

Q. Officer Chandler, I'm going to hand you this document.

A. Okay.

Q. And can you just take a moment -- do you recognize this document at all?

A. Yes.

Q. And what is this document?

A. It is the checkpoint guidelines.

Q. Okay. And do you see that on this document there's a "Purpose" section?

A. Yes.

Q. And do you see that Purpose section says that, "The purpose of this policy is to provide guidelines for the physical construction and operation of a sobriety checkpoint in order maximize the deterrent effect and increase the risk of -- perception of risk of apprehension of motorists who would operate a vehicle while impaired by alcohol or other drugs"?

A. Yes.

Page 50

Barry Chandler

Q. And had you seen that language before?

A. Yes.

Q. And looking at that section, is that your understanding of the sobriety checkpoint's purposes?

A. Yes.

Q. And while you were a deputy, were there any other purposes for setting up a sobriety checkpoint?

A. State your question again.

Q. And while you were a deputy with the MCSO, other than what's stated here, were there any other purposes for setting up a sobriety checkpoint?

A. By "purposes" you mean --

Q. Were there any other reasons that you as a deputy might set up a sobriety checkpoint?

MR. ROSS: Object to the form. I think he said that he was told where to go and where to -- when to conduct them. But you can answer to the extent of your ability.

MS. SIVASHANKER: And, Counsel, I'd just ask that, you know, you state your objection but that you don't coach the witness.

Page 51

Barry Chandler

MR. ROSS: Counsel, I'll make my objections the way I want to. Thank you.

BY MS. SIVASHANKER:

Q. You can go ahead and answer.

A. I'm still not sure of your question.

Q. I'm rephrase it then.

A. Okay.

Q. When you would set up a sobriety checkpoint --

A. Okay.

Q. -- as a deputy with MCSO, what generally was your understanding of the purpose of setting up a sobriety checkpoint?

A. To check for impaired drivers, either by alcohol or drugs.

Q. And other than for checking for impaired drivers under -- for alcohol or drugs, was there any other things that you were looking for during that time?

A. Driver's license and insurance and tags.

Q. And other than driver's license, insurance, and tags, were there anything else that you were looking for?

A. No.

Page 52

Barry Chandler

Q. I'm going to ask you on this same document if you can turn to the very last page, which should be Page 4.

And if you look towards the bottom, do you see a section titled General Roadblocks?

A. Yes.

Q. And have you seen this section before?

A. Yes.

Q. And has anyone ever -- in the Madison County Sheriff's Department, while you were there, had anyone ever gone through this section of the policy with you?

A. Not to my knowledge.

Q. And did you ever receive training at any point on this portion of the policy concerning general roadblocks?

A. I was given a copy of the -- these guidelines.

Q. And other than receiving a copy of these guidelines, did anyone ever discuss this portion of the guidelines with you in any sort of conversation or meeting?

A. The supervisor would go over the checkpoints.

Page 53

Barry Chandler

Q. And when would the supervisor typically go over the checkpoints with you?

A. When he advised that we were going to have a checkpoint.

Q. And would that guidance be provided every time in advance of setting up a checkpoint?

A. I cannot say to every time, no.

Q. And if you look at the -- subsection A of this portion of the policy, do you see that it says, "This section allows officers to conduct random roadblocks for all traffic violations, escapees, or wanted subjects"?

A. Yes.

Q. And based on your understanding and knowledge, do you know what it meant here by "random roadblocks"?

A. I don't understand.

Q. You see here that it says, "Random roadblocks for traffic violations, escapees or wanted subjects," correct?

A. Yes.

Q. And, again, just to your knowledge and understanding, when you see that term "random roadblocks" in this policy when you were a deputy

Page 54

1 Barry Chandler
2 at the MCSO, what did that term mean to you?
3 A. Our roadblocks were conducted at the
4 instructions of a supervisor.
5 Q. And the word "random" here, does that
6 have any meaning to you?
7 A. Does not.
8 Q. And if you look at subsection B of this
9 policy here, this language, do you see here that
10 it says, "The requirements of this section shall
11 not be confused with the policy set out above or
12 the methods to be used for sobriety checkpoints"?
13 A. That's correct.
14 Q. And can you explain to me your
15 understanding as a deputy, while you were at the
16 MCSO, what that language means there?
17 A. That this was a checkpoint for other
18 violations or laws being broken other than
19 sobriety.
20 Q. And in terms of other violations or
21 other laws being broken, what does that -- what
22 would the "other violations or laws" mean to you?
23 A. Driver's license, tag, insurance.
24 Q. And other than driver's license, tag,
25 and insurance, would there be any other sorts of

Page 55

1 Barry Chandler
2 violations that a roadblock might be set up for?
3 A. The only thing that -- if you found one
4 of those violations, then you would proceed to
5 other violations.
6 Q. And just to explore that a little bit,
7 when you say if you found one of those violations,
8 you would then proceed to other violations, what
9 do you mean by that?
10 A. If I check your driver's license and
11 your driver's license was suspended, then that
12 would lead to is there a warrant for your arrest.
13 Q. And when you said you would check
14 someone's driver's license, how would you go about
15 checking the driver's license?
16 A. Through our dispatch on the radio.
17 Q. And would you call in to dispatch with
18 the driver's ID information?
19 A. Yes.
20 Q. And would dispatch then run that
21 information for you immediately?
22 A. As immediately as they can.
23 Q. And when dispatch would run that
24 information, what kinds of information could they
25 tell you that they would see about that

Page 56

1 Barry Chandler
2 individual?
3 A. If they had a valid license. If they
4 had any outstanding warrants.
5 Q. And other than whether they had a valid
6 license and outstanding warrants, was there
7 anything else that dispatch could see when they'd
8 pull up someone's information like that?
9 A. I don't understand what you're asking.
10 Q. For example, would they be able to tell
11 if that person had valid insurance?
12 A. No.
13 Q. And could they tell if that person had
14 been previously convicted of a crime or offense?
15 MR. ROSS: If you know. I said if you
16 know.
17 A. I don't know.
18 BY MS. SIVASHANKER:
19 Q. And after a dispatch would run the
20 information, if an individual did have an
21 outstanding warrant, what would you do at that
22 time?
23 A. Arrest that person.
24 Q. And where was any -- was there ever a
25 situation, when you were a deputy, where someone

Page 57

1 Barry Chandler
2 had an outstanding warrant and you did not arrest
3 them?
4 A. No.
5 Q. And if you ran the person's information
6 with dispatch and there were no outstanding
7 warrants and the license was valid, what would you
8 do at that point?
9 A. Send them on their way.
10 Q. And if you sent them on their way
11 without any sort of issues regarding their license
12 or other issues, would there be any record of that
13 incident?
14 A. Not to my knowledge.
15 Q. And, for example, if you didn't issue
16 the driver of a vehicle anything, would you have
17 to fill out an incident report in that situation?
18 A. No.
19 Q. And what if you had given the driver,
20 for example, a citation? Would you have to fill
21 out an incident report in that situation?
22 A. Not for a citation.
23 Q. And in what circumstances would you be
24 required to fill out an incident report?
25 A. An arrest.

EXHIBIT 6

IN THE UNITED STATES DISTRICT COURT
FOR THE SOUTHERN DISTRICT OF MISSISSIPPI
JACKSON DIVISION

LATOYA BROWN; LAWRENCE)	
BLACKMON; HERBERT ANTHONY)	
GREEN; KHADAFY MANNING;)	
QUINETTA MANNING; MARVIN)	
MCFIELD, NICHOLAS SINGLETON;)	
STEVEN SMITH; BESSIE THOMAS;)	
and BETTY JEAN WILLIAMS)	
TUCKER, individually and on)	
behalf of a class of all)	
other similarly situated,)	
)	
Plaintiffs,)	
)	Civil Action No.
-vs-)	3:17-cv-347 WHB LRA
)	
MADISON COUNTY, MISSISSIPPI;)	
SHERIFF RANDALL S. TUCKER,)	
in his official capacity;)	
and MADISON COUNTY SHERIFF'S)	
DEPUTIES JOHN DOES #1)	
through #6, in their)	
individual capacities,)	
)	
Defendants.)	

The deposition of BRYAN RICCHETTI, Ph.D.,
taken before JUNE M. FUNKHOUSER, CSR, RMR, and
Notary Public, pursuant to the Federal Rules of
Civil Procedure for the United States District
Courts pertaining to the taking of depositions, at
181 West Madison Street, 43rd Floor, Chicago,
Illinois, commencing at 9:11 a.m. on April 6, 2018.

<p style="text-align: right;">Page 214</p> <p>1 A I didn't mean to say that.</p> <p>2 Q Maybe I misheard you.</p> <p>3 A Yeah, no.</p> <p>4 Q But then what about Exhibit 1 on page 14</p> <p>5 of your report, isn't that doing census</p> <p>6 benchmarking?</p> <p>7 A No. I'm looking at -- that's just</p> <p>8 reporting the share of people in each of these</p> <p>9 census tracts, the residents.</p> <p>10 Q But that's to suggest that the share of</p> <p>11 people in those census tracts comprise the share of</p> <p>12 people on the roads in those census tracts?</p> <p>13 A No.</p> <p>14 Q So you're not saying that?</p> <p>15 A No.</p> <p>16 Q Then why do I care about the residents of</p> <p>17 the census tract?</p> <p>18 A Because what we're looking at is whether</p> <p>19 roadblocks are happening disproportionately in</p> <p>20 areas where residents happen to be Black because</p> <p>21 residents might be impacted by that, as you</p> <p>22 discussed earlier there's -- you know, that</p> <p>23 roadblocks can impact people's lives, and so I'm</p> <p>24 not using that as a measure of the roadblocks for</p> <p>25 their driving behavior. I have direct measures of</p>	<p style="text-align: right;">Page 216</p> <p>1 driving behavior are direct measures of driving</p> <p>2 behavior, again, the DUIs and the traffic citations</p> <p>3 we have from the CAD data.</p> <p>4 Q All right. I'm going to turn to page x</p> <p>5 of the foreword.</p> <p>6 The -- it says here at the beginning</p> <p>7 of the first full paragraph at the top of the page,</p> <p>8 it says -- I'll let you get there.</p> <p>9 A Sure.</p> <p>10 Q And, again, this is I guess an authority</p> <p>11 you cited in your report. If that's not accurate</p> <p>12 let me know.</p> <p>13 A Yeah, I cite to it for just a general</p> <p>14 discussion of some methodological issues.</p> <p>15 Q "The question of whether bias influences</p> <p>16 some officers when they stop drivers, like many</p> <p>17 other social science research questions in criminal</p> <p>18 justice and related fields, is impossible to answer</p> <p>19 with complete certainty," do you agree with that?</p> <p>20 MR. YOUNGWOOD: Objection to form.</p> <p>21 THE WITNESS: Yeah, I would say in my</p> <p>22 analysis, again, talk about this causation issue,</p> <p>23 what I'm ultimately measuring is this average</p> <p>24 difference in outcomes controlling for other</p> <p>25 factors. I'm not measuring intentional -- any</p>
<p style="text-align: right;">Page 215</p> <p>1 driving behavior, which are DUIs and traffic</p> <p>2 behavior.</p> <p>3 Q And to be clear, I'm not talking about</p> <p>4 driving behavior. I'm talking about the population</p> <p>5 of people on the road. You're using the ACS data</p> <p>6 for census tracts to assume or project the racial</p> <p>7 distribution of drivers in those individual census</p> <p>8 tracts?</p> <p>9 A No.</p> <p>10 Q Then why do I have residential</p> <p>11 information about African-American population in</p> <p>12 this report at all?</p> <p>13 A Because we're looking at the placement of</p> <p>14 roadblocks and what the community racial breakdown</p> <p>15 is, the relationship between those two variables --</p> <p>16 Q I know.</p> <p>17 A -- but that variable is not -- when this</p> <p>18 paper is talking about benchmarking what they're</p> <p>19 saying is if you need to measure traffic behavior</p> <p>20 are you to assume that the share of people on the</p> <p>21 road in a given town is equal to the racial</p> <p>22 population of residents that's -- you know, you</p> <p>23 wouldn't want to assume that to be true because of</p> <p>24 commuting and the things we discussed, but that's</p> <p>25 not how I'm using my variable. My variable of</p>	<p style="text-align: right;">Page 217</p> <p>1 measure of bias directly. It's these average</p> <p>2 differences controlling for other factors.</p> <p>3 BY MR. NOBILE:</p> <p>4 Q Okay. So you're not making a finding of</p> <p>5 causation then. You're not saying they're making</p> <p>6 racial determinations. You're just saying the</p> <p>7 disparity in outcomes.</p> <p>8 A I do not have data on anyone's intentions</p> <p>9 or -- but what I can do is look at factors that I</p> <p>10 understand are considered when setting up</p> <p>11 roadblocks and see if, you know, again, are there</p> <p>12 more roadblocks in certain areas given, say, the</p> <p>13 level of DUIs, et cetera, so I can kind of rule out</p> <p>14 that those are explanations.</p> <p>15 Q Okay. On page 17 of this report, and</p> <p>16 I'll let you turn to it, the very top of the page,</p> <p>17 first partial paragraph.</p> <p>18 A Uh-huh.</p> <p>19 Q Midway through it says: "Additionally,</p> <p>20 nonresidents will drive into the target</p> <p>21 jurisdiction (the jurisdiction that is the subject</p> <p>22 of the police-citizen contact data analysis) to</p> <p>23 shop, seek entertainment, vacation, travel on to</p> <p>24 another jurisdiction, and for other reasons." You</p> <p>25 agree with that?</p>

55 (Pages 214 to 217)

<p style="text-align: right;">Page 226</p> <p>1 there some extra frequency of roadblocks associated</p> <p>2 with areas that happen to have more</p> <p>3 African-Americans.</p> <p>4 Q But that's based on residents, not on</p> <p>5 African-Americans on the road?</p> <p>6 A Yeah, but the question is -- the</p> <p>7 residents are the ones impacted by the roadblocks,</p> <p>8 as you discussed earlier, so the question is if you</p> <p>9 happen to be in a more African-American</p> <p>10 neighborhood in terms of the residency are there</p> <p>11 going to be more roadblocks, is there some extra</p> <p>12 number of roadblocks that might be happening.</p> <p>13 Q Are you saying, and these are fundamental</p> <p>14 questions to this case so I have to ask you this,</p> <p>15 are you saying that the officers that make the</p> <p>16 decisions or are you prepared to say that the</p> <p>17 officers that make the decisions about the</p> <p>18 placement of roadblocks are doing so for racist</p> <p>19 purposes?</p> <p>20 MR. YOUNGWOOD: Objection to form.</p> <p>21 THE WITNESS: My analysis does not</p> <p>22 address that.</p> <p>23 BY MR. NOBILE:</p> <p>24 Q And is anything in your report saying</p> <p>25 that you found an official policy of targeting or</p>	<p style="text-align: right;">Page 228</p> <p>1 that we work on, things like that. There's</p> <p>2 definitely some process.</p> <p>3 Q Okay.</p> <p>4 A I'm not involved in that.</p> <p>5 Q Okay. You're just -- you get it at the</p> <p>6 end?</p> <p>7 A Yeah.</p> <p>8 Q Can you check and let us know if</p> <p>9 Cornerstone does work for Simpson Thacher since you</p> <p>10 weren't able to answer that today?</p> <p>11 MR. YOUNGWOOD: He's not here to take</p> <p>12 homework assignments from you. Objection to form.</p> <p>13 BY MR. NOBILE:</p> <p>14 Q Okay. So that's a no? I mean, you</p> <p>15 didn't bring your file on any billing information</p> <p>16 that we asked for.</p> <p>17 MR. YOUNGWOOD: He doesn't have a file on</p> <p>18 billing information. You asked him about that.</p> <p>19 THE WITNESS: Yeah, I apologize, I did</p> <p>20 not. Because it's pro bono I just didn't --</p> <p>21 MR. YOUNGWOOD: He has no file.</p> <p>22 THE WITNESS: I tried to give you</p> <p>23 information on what -- the hours I worked.</p> <p>24 MR. NOBILE: We do have a right to try to</p> <p>25 ascertain the support for bias, Mr. Youngwood.</p>
<p style="text-align: right;">Page 227</p> <p>1 deliberately using race as a measure of selecting</p> <p>2 roadblock locations?</p> <p>3 A No, my analysis would be the outcomes of</p> <p>4 whatever is happening and there appears to be this</p> <p>5 disparity that I'm measuring.</p> <p>6 Q Does Cornerstone keep track of the time</p> <p>7 it spends on pro bono work?</p> <p>8 A I typically don't. I've done pro bono</p> <p>9 work before. I'm not sure if everyone does. I can</p> <p>10 speak for myself. I don't like entering time, so</p> <p>11 if I don't have to I'm not going to do it.</p> <p>12 Q Do you know if Cornerstone has a policy</p> <p>13 on tracking pro bono work?</p> <p>14 A I don't know.</p> <p>15 Q Time spent doing it?</p> <p>16 A I mean, if it is then I'm not following</p> <p>17 that policy.</p> <p>18 Q Does Cornerstone management or leadership</p> <p>19 pick the pro bono cases it works on or how are</p> <p>20 those selected?</p> <p>21 A Yeah, there's definitely -- you know,</p> <p>22 there's some sort of committee and we think about</p> <p>23 various fact -- you know, we're trying to find</p> <p>24 opportunities to give people professional</p> <p>25 development opportunities, cases that are in fields</p>	<p style="text-align: right;">Page 229</p> <p>1 MR. YOUNGWOOD: The what?</p> <p>2 MR. NOBILE: The support for bias in the</p> <p>3 report. And he's not being compensated, but, I</p> <p>4 mean, you know, you have to forgive me, but I'm a</p> <p>5 little cynical and not everything is altruism and I</p> <p>6 suspect there's some compensation somewhere or some</p> <p>7 psychic benefit that probably goes to Cornerstone's</p> <p>8 bottom line and we are entitled to figure that out.</p> <p>9 MR. YOUNGWOOD: I have no idea what</p> <p>10 you're talking about.</p> <p>11 MR. NOBILE: You have no idea about --</p> <p>12 MR. YOUNGWOOD: You think we're secretly</p> <p>13 paying them or something?</p> <p>14 MR. NOBILE: No, I don't think you're</p> <p>15 secretly paying them.</p> <p>16 MR. ROSS: But we would like to know if</p> <p>17 you hire them on your paying cases and the reason</p> <p>18 they're doing this pro bono is because you hire</p> <p>19 them on other cases.</p> <p>20 MR. YOUNGWOOD: Why don't you ask him</p> <p>21 that.</p> <p>22 MR. ROSS: He said he didn't know.</p> <p>23 MR. NOBILE: He said he didn't know.</p> <p>24 MR. YOUNGWOOD: No, I don't think you</p> <p>25 asked him if he's doing this so that we'll hire him</p>

EXHIBIT 7

1 ANGELA LYONS
2 UNITED STATES DISTRICT COURT
3 FOR THE SOUTHERN DISTRICT OF MISSISSIPPI
4 NORTHERN DIVISION

5 LATOYA BROWN; LAWRENCE BLACKMON;
6 HERBERT ANTHONY GREEN; KHADAFY
7 MANNING; QUINNETTA MANNING; MARVIN
8 MCFIELD; NICHOLAS SINGLETON;
9 STEVEN SMITH; BESSIE THOMAS; AND
10 BETTY JEAN WILLIAMS TUCKER,
11 INDIVIDUALLY AND ON BEHALF OF A CLASS
12 OF ALL OTHERS SIMILARLY SITUATED PLAINTIFFS

13 V. CIVIL ACTION NO. 3:17-CV-00347-WHB-LRA

14 MADISON COUNTY, MISSISSIPPI;
15 SHERIFF RANDALL S. TUCKER, IN HIS
16 OFFICIAL CAPACITY; AND MADISON COUNTY
17 SHERIFF'S DEPUTIES JOHN DOES #1 THROUGH
18 #6, IN THEIR INDIVIDUAL CAPACITIES DEFENDANTS

19 DEPOSITION OF ANGELA LYONS

20 Taken at the instance of the Plaintiffs on
21 Friday, February 9, 2018,
22 at the Marriott, Jackson, Mississippi,
23 beginning at 8:59 a.m.

24 JOB NO. 137178

25 REPORTED BY: Tamara Hartwig Fulgham, CSR, BCR

Page 98

1 ANGELA LYONS

2 BY MS. SIVASHANKER:

3 Q Ms. Lyons, do you recognize this letter?

4 A Yes.

5 Q And is this one of the letters that you
6 reviewed in your preparation meeting with counsel
7 before this deposition?

8 A Yes.

9 Q And you see this letter is dated
10 October 31st, 2017?

11 A Right.

12 Q Can you explain what made you decide to
13 write this letter?14 A The same -- the same exactly what I'm
15 saying, is that the coming on the property -- how
16 can I say -- like coming on the property, sitting in
17 an area playing loud music, drinking. Okay. Heavy
18 traffic. That's what I'm saying. Just a lot of
19 heavy traffic.20 Q And the heavier traffic than normal
21 statement that's made here is an issue you observe
22 in the community --

23 A Uh-huh.

24 Q -- what did you mean by that?

25 A I -- I -- I saw, my own eyes, boys on

Page 99

1 ANGELA LYONS

2 bicycles with guns. Also I saw with my own eyes,
3 like they had a drive-in that seems to be passing
4 money and getting something in their hands, which I
5 really can't say what it was. But riding on those
6 bicycles like that.

7 Q And --

8 A I noticed this myself.

9 Q And within Canton Estates, is there any,
10 like, posted speed limit signs?

11 A It is when you first drive in.

12 Q And what is the speed limit when you
13 drive --

14 A 15.

15 Q And the 15-miles per hour, is that also
16 the same speed limit right outside of the Canton --17 A I don't know outside. But the residents
18 was complaining about them driving through there too
19 fast.

20 Q And --

21 A People driving through too fast.

22 Q -- just to walk through these issues. One
23 of the issues is the heavier traffic that we talked
24 about?

25 A Uh-huh.

Page 100

1 ANGELA LYONS

2 Q Before you sent this letter in October
3 2017, is that an issue you had observed as manager
4 in the complex before that?

5 A Correct.

6 Q And the second issue is the individual or
7 the -- I'm sorry -- individuals loitering with no
8 particular destination in mind. Do you see that
9 there?

10 A Yes.

11 Q Is that, also the loitering issue, is that
12 also something you observed in the complex before
13 this letter?

14 A Yes.

15 Q And you have here individuals sitting on
16 stairs smoking something which appears to be
17 marijuana. Is that an issue that you had seen in
18 the complex before?

19 A Yes.

20 Q And then the last issue mentioned is the
21 young males riding through on bicycles --

22 A Right.

23 Q -- with what appears to be handguns. Is
24 that an issue that you'd seen previously in the
25 complex?

Page 101

1 ANGELA LYONS

2 A Yes.

3 Q And do you know who those young males
4 were?

5 A No.

6 Q And in this letter, you request the
7 Madison County Sheriff's Department for additional
8 patrol specifically between the hours of 5 p.m. and
9 2 p.m., correct?

10 A Correct.

11 Q Is there any reason that you requested the
12 patrols during that time?

13 MR. ROSS: 5 p.m. to 2 a.m.

14 BY MS. SIVASHANKER:

15 Q Yeah, sorry. 5 p.m. and 2 a.m.

16 A Because that's when it start -- really
17 starting happening, like things were going on during
18 that -- that's the reason I asked for that time.
19 And then -- yeah. And then I had residents
20 complaining, saying after one o'clock, mostly
21 two o'clock or three o'clock where they could hear
22 people outside of their units that's keeping up a
23 lot of noise and they're not resting.24 Q And so when requesting the 5 p.m. and
25 2 a.m. between hours patrols, did you think that

Page 102

ANGELA LYONS

would be the time period where the patrol might be effective?

A I think so. Uh-huh.

Q And after you sent in this letter in October of last year, do you know if any extra patrols did actually happen at Canton Estates?

A Yes.

Q And do you know how soon after you sent this letter the patrols occurred?

A I can't say.

Q And when those patrols occurred, in your opinion did you find the patrols to be helpful in reducing some of these issues?

A Uh-huh. Slacking it off. Uh-huh.

Q And also in this letter towards the end, you pose the question "Is it possible to set up a random roadblock in our area?" Do you see that?

A Yes.

Q What did you mean by random roadblock?

A Random, anytime.

Q And so random to you meant any time of day --

A Uh-huh. Anytime.

Q And when you say "in our area," were you

Page 103

ANGELA LYONS

referring to the area right outside of the entrance of Canton Estates?

A Correct. Anytime.

Q And do you know if a roadblock was set up after you sent in this letter?

A I don't -- I can't remember if it was or not.

Q And do you see the next line, it says "Any preventive measure that you can offer is greatly appreciated" --

A Appreciated. Right.

Q And what did you here, do you mean by any preventive measure?

A Whatever they wanted -- whatever decisions that Madison County want to make.

Q And when you said "preventive measure" --

A To deter.

Q And to deter these activities?

A Right.

Q And other than this particular letter where you asked if it's possible to set up a random roadblock, do you recall if you ever sent in any other letters requesting a random roadblock be set up?

Page 104

ANGELA LYONS

A No.

Q And do you recall if this is the first time that you requested for a random roadblock to be set up?

A To my knowledge.

Q Ms. Lyons, do you know -- are you familiar with the term "Neighborhood Enhancement Team"?

A Huh-uh.

Q Have you -- I'm sorry. I'm -- just to make it clear for the record, "huh-uh," does that mean no?

A No.

Q Okay.

A Okay.

Q Sorry. The only reason is when the court reporter takes things down, if you say uh-huh --

A Oh, okay.

Q No --

A Okay.

Q -- it's fine.

A Okay. I'm sorry.

Q And are you familiar with the term "NET Team" at all?

A Jump-out boys I guess.

Page 105

ANGELA LYONS

Q And so in your understanding, the NET Team, does that refer to the jump-out boys?

A I think to me -- that's what I know is jump-out boys.

Q And have you ever heard any of the residents in the Canton Estates refer to the NET Team as the jump-out boys to you?

A Yeah. Uh-huh.

Q And when you've seen the jump-out boys conduct patrols in Canton Estates, do you find those patrols in your observations to be any different from the other patrols that might take place in the complex?

A No.

Q And I know we talked about this a little bit, but you've met or you're familiar with Sheriff Randy Tucker, correct? You're familiar with Sheriff Randy Tucker?

A Okay. Uh-huh.

Q And other than the couple times I think you mentioned that you saw him at a meeting with Chief Williams, have you ever had any discussions or phone calls with Sheriff Tucker separately from that?